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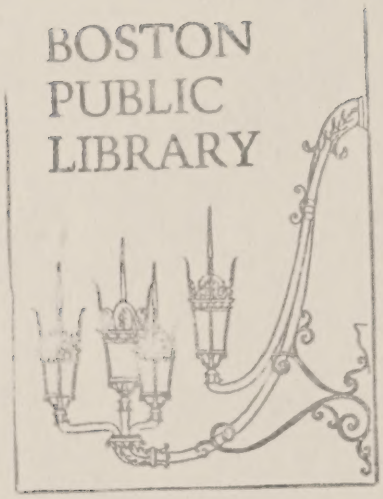
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TAX CONSTRAINT AND FISCAL POLICY: AFTER THE PROPERTY TAX

Volume II - Analytic Tools and Techniques

Final Report of the
Tax Policy Analysis and Planning Study Effort, 1976-82,
Undertaken with the Financial Support of
HUD Research Grant H-2628-RG

John Avault

Boston Redevelopment Authority
Research Department

September 27, 1983

Kevin H. White, Mayor
City of Boston

Robert J. Ryan, Director
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Alexander Ganz, Research Director
and Tax Policy Study Director

Boston Redevelopment Authority
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Analytic Tools and Techniques

Table of Contents

Chapters

I. Introduction

The Purpose of the Project
Organization of the Report
Guide to the Contents

II. Determining Property Values; Identifying the Disperson and Distortion in Effective Tax Rates

Introduction

Problem: Sales Data Needs Unmet
Solution: Organization and Automation of Ongoing City Record Keeping
Sales Data: Sources and Contents
An Overview of the SALES System
Data Recording
HMS-SALES (A computer file and report system)
HIST: Histogram Illustration, STatistics

Estimating Boston's Tax Base: 1978

Small Residential Properties
Condominiums
Apartments
Commercial
Personal Property
Land, Industrial, and Mixed-Use Realty

Value Estimates for Other Massachusetts Communities

Appendix II-A Technical Description of the HMS Computer File System

Appendix II-B Introductory Users Manual for HMS-SALES Information Management System

Appendix II-C Boston Real Estate Activity: 1975

Appendix II-D Translating Measures of Commercial Property Tax Effort

III. Measuring Time Trends in Property Value, and Projecting How Values Would Change with Revaluation and Classification

General Introduction

An Introduction to the Residential Value Index

The Index Problem and a Non-Hedonic Solution
Updating the Residential Value Index
Assumptions and Interpretations; Sample Selection and Weights
Testing for Differences Among Property Types Within a Neighborhood
The Boston City Residential Value Index
Data Sources
Procedures and Programs for Computing the R.V.I.

An Introduction to Tax Capitalization

A Simple Model of Tax Capitalization
Iterative Adjustment to Equilibrium
The Steady State Path to Equilibrium
An Alternative Derivation
Equilibrium Value Tax Base
Expanding the Notation for Classification
Expanding the Model for Reality

Appendix III-A Planning District and Boston City Residential Value Index With Supporting Tables

Appendix III-B Preliminary Estimates of the 1979 R.V.I: An Update for Boston and Wards by Chained Link Relatives

Appendix III-C A Catalog of Computer Resources for the R.V.I. and Program Lists

IV. The Fiscal and Economic Context for Reducing the Role of the Property Tax

Making Proposition 2½ Work Through Statewide Revenue Reform
Boston's Recent Fiscal History (Fiscal Accounts Analysis)
The "Lottery" Formula for State Aid Distribution

V. Simulating Revaluation

Calculating Estimates
Interpreting Output

Appendix V-A Massachusetts Law Chapter 580--An Act Providing for The Taxation of Real Property by Usage Classification

Appendix V-B Massachusetts Law Chapter 797--An Act Making Changes in the Law Providing for the Taxation of Real Property BY Usage Classification

Appendix V-C FY1981-Certification/Classification Status Reports as of 3/13/81

I. INTRODUCTION

The Purpose of the Project

This second volume of Fiscal Policy and Tax Constraint: After the Property Tax documents the data and details the methods employed in the course of the study. Some modicum of technical back-up is standard for this kind of work. But why a whole volume? Isn't this material just the exhausted means to an accomplished end? In this case, the answer is no. The analytic tools and techniques developed have not outlived their usefulness. Their purpose is improved process, not just a product; and the process has not ended. The processes we are concerned with are fiscal policy analysis and tax base management. These have operational, analytic, and organizational aspects. We have attempted, therefore, to develop tools for operations, techniques for analysis, and systems for communication within and among organizations.

Organization of the Report

Our documentation was prepared for the generalist as well as the specialist. The exposition of each topic usually begins in English and then proceeds into algebra or other technical language. We beg the reader's patience and persistence in finding the desired level of detail.

The following chapters are generally self-contained and independent of one another, although there is some explicit cross-referencing. Some chapter topics are fairly broad and major sub-sections can stand without mutual support. The reader is invited to sample all or pick and choose, as interest dictates.

Guide to the Contents

Chapter 2 has two principal components. The first is information management and analysis of property sales data. The prototype system described was one of the first projects of our study group. Some of the needs that this system addressed have since been satisfied by the achievements of the Boston Office of Property Equalization. Other aspects of the system, addressing a wider range of application, are still novel. The second part of Chapter 2 describes the estimation of Boston's property tax base as of mid-1978. The significance of the substantive findings presented in Chapter 4 and 5 of Volume I depends largely on this aspect of our work. The chapter concludes with an evaluation of the tax-base data utilized for other Massachusetts communities.

Chapter 3 deals with two dynamic aspects of property values. The Residential Value Index is a statistical tool for summarizing historical data on market value trends. In addition to its usefulness in viewing the past, it provides a means to extrapolate into future trends. Tax capitalization is the process by which property taxes influence property values. The solution to the "equilibrium" problem is incorporated into the equalization simulations presented in the first volume.

Chapter 4, "The Fiscal and Economic Context for Reducing the Role of the Property Tax", contains background papers developed in the course of the study. "Boston's Recent Fiscal History; City of Boston Expenditures and Revenue, 1960-FY1982", by Gregory Perkins, is a fiscal accounts analysis drawn principally from the records of the Auditing Department. The tables from that work are contained here. "The 'Lottery' Formula" describes this state aid distribution mechanism and lists the share of aid due Massachusetts' 351 cities and towns based on FY1976 and FY1978 parameters. "Making

Proposition 2½ Work Through Statewide Revenue Reform" examines fiscal benefits to the cities of Boston and Lynn that would derive from "place of origin" allocation of revenues from new or expanded taxes. An increase in the meals and retail sales tax rates, a broadening of the sales tax base to include selected services, and a temporary payroll tax are the options considered.

Chapter 5 summarizes the application of the tax capitalization model described in Chapter 3 to the estimation of property taxes and values during the equalization process. Examples of major computer output are presented and interpreted. Appendices contain the texts of Massachusetts property tax classification laws.

Chapter II

DETERMINING PROPERTY VALUES; IDENTIFYING THE DISPERSION AND DISTORTION IN EFFECTIVE TAX RATES

	Page
Introduction	II-1
Problem: Sales Data Needs Unmet	4
Solution: Organization and Automation of Ongoing City Record Keeping	4
Sales Data: Sources and Contents	7
An Overview of the SALES System	13
Data Recording	16
HMS-SALES (A Computer File and Report System)	18
HIST: Histogram Illustration and STatistics	22
Estimating Boston's Tax Base: 1978	34
Small Residential Properties	34
Condominiums	41
Apartments	42
Commercial Realty	44
Personal Property	47
Land, Industrial, and Mixed Use Realty	48
Value Estimates for Other Massachusetts Communities	51
Appendix II-A Technical Description of the HMS Computer File System	
Appendix II-B Introductury Users Manual for HMS-SALES Information Management System	
Appendix II-C Boston Real Estate Activity: 1975	
Appendix II-D Translating Measures of Commercial Property Tax Effort	

II. DETERMINING PROPERTY VALUES; IDENTIFYING THE DISPERSION AND DISTORTION IN EFFECTIVE TAX RATES

One of the most important and difficult tasks we face in investigating the property tax is that of estimating property values. The value question is central since the property tax is an ad valorem (according to the value) levy. The issues of assessing performance, disproportionment relief, revaluation impacts, and alternative policy evaluation (such as classification or special exemptions and abatements) all revolve around value.

So broad and diverse is general interest in the question of property values that no one definition of "value" will suffice for all purposes and preferences. A variety of labels such as sales value, fair cash value, economic value, use value, capitalized value, replacement value, etc. support an even greater variety of arguments over whether these terms refer to the same or different things. Even in situations where an approach to value has been agreed upon or mandated by legislature or judicial tradition, there may be significant disagreement on the "facts" that add up to the bottom line of value for a subject property. Further multiplying the numerous candidates for "value" that are the product of rival conceptual approaches and alternative bodies of substantive data are the possible levels of exactitude and expense on which the task of determining value can be pursued. The most precise and costly approach - fee appraisal - involves an expert professional's detailed examination of an individual property to determine its worth at the time of appraisal. Next in accuracy and expense is mass appraisal, the estimation of value for all or many properties in a tax jurisdiction to establish or update property tax assessed values. Mass appraisal values each property individually on the basis of moderately detailed parcel-specific information, operating under a budget constraint

while aiming for target goals of accuracy and fairness.* The value estimates are usually at least a year out of date due to the time requirements of data collection. A third and final level of investigation into property values is the estimation of aggregates. In this bargain basement of real estate research the investigators typically lack the hard currency of organized parcel-specific data and so they aim only to approximate the average or total value for groups of properties, using statistical tools and the most direct evidence of value they can obtain (such as sales prices or net operating income) for a sample of properties. On this level we discuss "all properties", "the average for properties", or "the typical property".

The work detailed in this report takes place at the level of aggregate property value estimation. We have sought averages and totals of value for the greatest number of "sensibly" defined property groups that we could describe with adequate data. On the question: "What is value?" we have used the common view that it is the price that probably

---

* Budget economy is often discussed in terms of average dollar cost per parcel. These costs can vary by as much as a factor of ten among communities. Overall accuracy is often measured by the average ratio of appraised value to sales value, while common measures of fairness are comparisons of average ratios for different groups of properties and the Coefficient of Dispersion (C.O.D.): the mean percent difference of individual appraisal/sales value ratios from the median ratio. Target C.O.D.s (acceptable average percent error from uniform proportionment) are often in the 10 - 15 percent range.

would be settled upon in an "arms-length" transaction between a willing buyer and a willing seller. Admittedly, this is not a mechanically precise definition, but then the real estate marketplace is a stage for human rather than machine actors. The subjective elements of value perception and unique circumstances that may accompany purchase or sale decisions can strip even a valid sales price of absolute finality. Sales price is sometimes viewed as a random variable distributed about a mean that is actual market value. Still, the appeal to actual markets grounds us in reality and will provide a basis for reasoned discussion should reasonable agreement fail. Except where otherwise indicated, we view the differences among approaches to value as methodological--a variety of means to achieve a common end dollar figure.

For convenience we can sort most value methods into three groups. Cost/depreciation (1) approaches require first of all a sophisticated data base of physical stock (floor space, quantity and quality of materials and their condition). We had no such data; we used no such methods. Income capitalization techniques (2) are formalizations of decision-making processes that balance the profitability of a property against profit rate requirements and alternative opportunities confronting owner-investors. We have made some empirical use of income capitalization in examining office and apartment rental properties, as described later in this chapter. Capitalization methods are central to the theoretical consideration of tax capitalization (the effect of property taxes on property values) in the following chapter. Sales price (3) methods have the advantages of being fairly direct and easy to understand while utilizing generally available information.

We have relied heavily on sales price methods and data because of both their usefulness to our present purposes and also the variety of other unmet needs requiring the development of an organized base of property sales data.

Problem: Sales Data Needs Unmet

Boston real estate sale prices are matters of public record on file at the Suffolk County Registry of Deeds. But although available, the information is not useful for research and management purposes. It is neither organized nor complete. The type of property, its assessed value for tax purposes, and in many cases the standard address are missing. Existing commercial services and periodicals fail to overcome these shortcomings of incompleteness and inflexible organization. While providing "a lead" to realtors and fee appraisers who might be working with an individual property or area, registry abstracts and derived subscription services do not constitute a cost effective resource for extensive public sector work: the appraisal and purchase or sale of real estate, revaluation, the abatement litigation process, neighborhood and development planning, fiscal management, economic and housing analysis, policy evaluation, etc.

Solution: Organization and Automation of Ongoing City Record Keeping

Fortunately, City Hall has the resources as well as reasons to remedy the problem of inadequate property sales data. The Boston Assessing Department has for years received property sales data from the County Registry of Deeds and completed it with valuable information such as verified standard

address, property type, assessed value, Ward of location, and parcel number (a unique identifier and link to other property data). At this level of detail the collected data already have significant value, and the records are distributed to assessing staff for operational use. But to serve research and management ends or uses in other City operations, these data would have to be centralized and reorganized. Knowing that it is there is not enough; we must be able to find it. Centralization presently goes no further than handwritten preparation of the Property Sales Report to State Tax Commission (form 3S) which the State Revenue Department uses to estimate the market value of taxable realty in its Biennial Equalization Survey. The report forms call for the following items on each property sold within the City, by Ward of location:

Col. 1	Col. 2	Col. 3	Col. 4	Col 5	Col. 6	Col. 7	Col. 8	
Recorded Date	Book & Page	A. Grantor B. Grantee C. Address of Property	Class	Non-Arms Length Code*	Sale Price	Assessed Valuation	Vacant	
							Zoning	De

These Sales Report forms were the primary source of data fed into the prototype SALES recording and reporting system and used by the Tax Policy Study research team. HMS-SALES* was built and now resides on the City of Boston computer to encourage continuing in-house use. The information in

* HMS-SALES is the system's full name. HMS (Hierarchic Management System) is a copywrited interactive information management system builder developed by Karl Sittler, the Tax Policy Study's computer applications specialist. The MASTAX and OFFICE data bases described later in this work are also managed by HMS built systems.

SALES could be made simultaneously available to any number of authorized users, each of whom could regard the contents as being filed according to different characteristics (by location, time of sale, property class, type of conveyance, price level, assessed value, parcel size, etc.) to accommodate a variety of needs. Hard copy lists and file cards printed by this study project have demonstrated that the computerized system can support maintenance of traditional files and use of manual methods. Continuous update could be accomplished by one person devoting less than half time to the effort.* The system itself performs flexible search and report tasks, or its contents can be read by special purpose analytic programs.

The following sections describe SALES in detail: its contents, an overview of the system, reports generated by the system, and analysis of SALES system data by the HIST program. Finally, we will review the value estimates for small residential properties that are based on sales price data and then direct our attention to the estimation of value via income capitalization and the Office Industry Survey.

---

* This estimate pertains to transcription into the HMS-SALES system from Property Sales Report to State Tax Commission forms. Assuming 5,000 "one sale, one property, one price" transactions annually (the average from 1971 through 1976 was fewer than 4,000), a seven-hour work day, and a fifteen record per hour input rate (achievable with low level typing skills) implies a need for 48 days of effort. Prerequisite to this task are two to four days spent marking multi-parcel sales not useful for input and determining "sale type codes" (see Exhibit II-2) which indicate acceptability for analysis and identify marketplace actors. A two-person team might accomplish proofreading, correction, and research for undetermined sale type codes in ten to fifteen days. Total annual effort requirement: 70 to 82 person days.

Use of SALES for initial data recording and organization and the subsequent automated printing of the 3S forms for the State Tax Commission might have little or no net manpower cost and could maintain more timely files. This would also overcome the illegibility, incompleteness, and inconsistency of handwritten 3S forms.

SALES Data: Sources and Contents

HMS-SALES contains records on 23,475 real property sales that occurred within the City of Boston between 1971 and 1976. All of the recorded sales are single property conveyances. Ownership transfers of multiple parcels are of little use to our immediate purpose since a single price for a collection of several properties does not tell us the sales price attributable to each property. Multiple parcel sales were tallied by property and conveyance types within each Ward, but their full inclusion in the system waits upon the demand and criteria for such inclusion.

Exhibit II-1 shows what data are filed in SALES for the six years covered. Although SALES has uniform space and structure for each year covered, actual contents at present reflect the non-uniformity of data sources and varying availability of staff effort. Sale records from 1971 through 1974 were transcribed into the system under the sponsorship of the Assessing Research and Legal Assistance Group* from the Metropolitan Mortgage Bureau's Appraisers' Weekly cards. Prior to its demise in 1975, Appraisers' Weekly provided subscribers with summaries of property sale and mortgage transactions compiled from County Registry, City Assessing, and bank sources printed on a 3x5 file card format. Replication of this file card format using a tape memory word processor and Property Sale Report to State Tax Commission (3S) forms for 1975 had been undertaken by BRA Research prior to the initiation of the Tax Policy Study. These new cards (pictured in Exhibit II-3) were to update the

* ARLAG was an interdepartmental City task force formed in the fall of 1977 to evaluate options for dealing with the growing burden of property tax related litigation.

Appraisers' Weekly files maintained by the BRA Real Estate Department while aiding the update of the Residential Property Market Value Trend INDEX described in the following chapter. Inheriting this effort when sales from the first six months of 1975 had been recorded onto file cards, the Tax Policy Study team developed SALES using the data forms for the last six months of 1975 as starting material. Entries on the forms were verified using Assessing Department files where parcel square footage and other missing elements were noted. Planning District location was added from printed DIME file lists and map references. Only sources internal to City Hall were used. The most complete records in SALES are those from this July to December, 1975 period. This data set was to demonstrate a minimum level of thoroughness attainable in describing property sales using only in-house resources. These records were automatically printed onto file cards to show the versatility of automated record keeping and its compatibility with traditional methods of operation. This being accomplished, only those data required for calculations to estimate property values and tax burdens were typed into the system for the first half of 1975. The records from all of 1975 were the basis for our substantive research. Material from the 1976 Property Sales Report to State Tax Commission was fed to SALES, but not verified and completed using Assessing files.

EXHIBIT II-1

CONTENTS OF SALES FILE BY YEAR

		1971-74	Jan.-June 1975	July-Dec. 1975	1976
	Ward	X	X	X	X
1)	Assessor's Parcel Number			X	
2)	Bock & Page No.			X	
	Parcel Address	X		X	X
3)	Neighborhood	X	X	X	
3)	Planning District		X	X	
	Total Assessed Value	X	X	X	X
	Parcel Square Feet	X	X	X	
	Property Seller Name	X		X	X
	Property Buyer Name	X		X	X
	Total Sales Price	X	X	X	X
	Assumed Mortgage	X	X	X	X
	Mortgage	X			
3)	Mortgagee	X			
3)	Property Class	X	X	X	X
	Date Sale Recorded	X		X	X
3)	Type of Sale	X	X	X	X

1) Within each Ward the Assessor's Parcel Number is a unique property identifier that can allow for the linking of SALES file records with other computerized files.
2) The Book and Page numbers locate conveyance documentation at the County Registry of Deeds.
3) A list of coded alternatives is provided in Exhibit II-2.

EXHIBIT II-2
TYPE OF SALE

DE	MEANING
	PRIVATE
N	PRIVATE - NUTS
P	PRIVATE - PRICE PROBLEM
T	PRIVATE - NO CLASS
L	PRIVATE - NO ASSESSED VAL
C	PRIVATE - CITY
A	PRIVATE - AUTHORITY
H	PRIVATE - HUD/VA
B	PRIVATE - BANK
S	PRIVATE - STATE
I	PRIVATE - INSTITUTIONAL
	CONVENIENCE SALE
	FAMILY SALE
C	CITY - CITY
A	CITY - AUTHORITY
H	CITY - HUD/VA
B	CITY - BANK
S	CITY - STATE
I	CITY - INSTITUTIONAL
P	CITY - PRIVATE
A	AUTHORITY - AUTHORITY
C	AUTHORITY - CITY
H	AUTHORITY - HUD/VA
B	AUTHORITY - BANK
S	AUTHORITY - STATE
I	AUTHORITY - INSTITUTIONAL
P	AUTHORITY - PRIVATE
H	HUD/VA - HUD/VA
C	HUD/VA - CITY
A	HUD/VA - AUTHORITY
B	HUD/VA - BANK
S	HUD/VA - STATE
I	HUD/VA - INSTITUTIONAL
P	HUD/VA - PRIVATE
B	BANK - BANK
C	BANK - CITY
A	BANK - AUTHORITY
H	BANK - HUD/VA
S	BANK - STATE
I	BANK - INSTITUTIONAL
P	BANK - PRIVATE
S	STATE - STATE
C	STATE - CITY
A	STATE - AUTHORITY
B	STATE- BANK
H	STATE - HUD/VA
I	STATE - INSTITUTIONAL
P	STATE - PRIVATE
I	INSTITUTIONAL-INSTITUTION
C	INSTITUTIONAL - CITY
A	INSTITUTIONAL - AUTHORITY
H	INSTITUTIONAL - HUD/VA
B	INSTITUTIONAL - BANK
S	INSTITUTIONAL - STATE
P	INSTITUTIONAL - PRIVATE
	UNKNOWN

Coded Categories

P (Private) is the code for private "arms length" market sales. Only sales labeled P were used in analysis to estimate market values.

V (Convenience Sale) designates conveyances such as "from Smith to Smith & spouse" or "from Smith to Smith trustee".

F (Family) refers to sales between parties having the same last name.

PN indicates that sale type is as yet undetermined and requires further research.

PP is used in cases where the price recorded is incomplete (such as an unknown amount of outstanding mortgage obligation assumed) or believed incorrect.

PT and PL signify a missing key datum that precludes use of this sale record for analysis. No assessment (PL) often signifies a new property.

All other two letter codes describe special categories of seller (first letter) and buyer (second letter):

- P = Private individual
- C = City
- A = Public Authority (BRA, Mass. Port Authority)
- H = HUD or VA
- B = Bank or other mortgage lender
- S = State
- I = Institutional (School, Church, etc.)

Exhibit II-2 (cont.)

Coded Categories

PLANNING DISTRICT

CODE	MEANING
1	EAST BOSTON
2	CHARLESTOWN
3	SOUTH BOSTON
4	CENTRAL
5	BACK BAY-BEACON HILL
6	SOUTH END
7	FENWAY-KENMORE
8	ALLSTON-BRIGHTON
9	JAMAICA PLAIN-PARKER HILL
10	WASHINGTON PARK - M.C.
11	SOUTH DORCHESTER
12	ROSLINDALE
13	WEST ROXBURY
14	HYDE PARK
15	MATTAPAN-FRANKLIN
16	NORTH DORCHESTER
17	UNKNOWN

MORTGAGEE

CODE	MEANING
NEM	NEW ENGLAND MERCH. BANK
FNB	FIRST NATIONAL BANK
SHW	SHAWMUT BANK
PIS	PROVIDENT INST. FOR SAVIN
OCB	OTHER COMMERCIAL BANK
BFC	BOSTON FIVE CENT SAV.BANK
CSB	CHARLESTOWN SAVINGS BANK
SFSB	SUFFOLK-FRANKLIN S.B.
HSB	HOME SAVINGS BANK
DSB	DORCHESTER SAVINGS BANK
SBSB	SOUTH BOSTON SAVINGS BANK
LSB	LINCOLN SAVINGS BANK
HISB	HIBERNIA SAVINGS BANK
HPSB	HYDE PARK SAVINGS BANK
GHSB	GROVE HALL SAVINGS BANK
BRSB	BRIGHTON FIVE CENT S.B.
ESB	ELLIOT SAVINGS BANK
EBSB	EAST BOSTON SAVINGS BANK
UWSB	UNION WARREN SAVINGS BANK
OSB	OTHER SAVINGS BANK
BFSL	BOSTON FEDERAL SAV.&LOAN
HSL	HOME OWNERS SAV.&LOAN
OSL	OTHER SAVINGS & LOAN
MMC	MALMART MORTGAGE COMPANY
OMC	OTHER MORTGAGE COMPANY
MCB	MERCHANTS COOP. BANK
WCB	WORKINGMANS COOP. BANK
PCB	PIONEER COOPERATIVE BANK
VCB	VOLUNTEER COOP. BANK
HCB	HAYMARKET COOP. BANK
BRCB	BRIGHTON COOPERATIVE BANK
MVCB	MT. VERNON COOP. BANK
MHCB	MEETING HOUSE HILL C.B.
DMCB	DORCHESTER-MINOT C.B.
OCOP	OTHER COOPERATIVE BANKS
CRU	CREDIT UNIONS
O	OTHER
S	SELLER
U	UNKNOWN

NEIGHBORHOOD

CODE	MEANING
BO	BOSTON
BR	BRIGHTON
CH	CHARLESTOWN
DO	DORCHESTER
EB	EAST BOSTON
HP	HYDE PARK
RO	ROXBURY
SB	SOUTH BOSTON
WR	WEST ROXBURY
U	UNKNOWN

PROPERTY CLASS

CODE	MEANING
R1	ONE FAMILY
R2	TWO FAMILY
R3	THREE FAMILY
R4	APARTMENTS (4+)
CO	CONDOMINIUM
RC	MIXED RESIDENTIAL/COMM.
C	COMMERICAL
D	DORMITORY
I	INDUSTRIAL
L	LAND
LH	LODGING HOUSE
SP	SPECIAL
U	UNKNOWN

WARD OF SALE

CODE	MEANING
1	WARD 1
2	WARD 2
3	WARD 3
4	WARD 4
5	WARD 5
6	WARD 6
7	WARD 7
8	WARD 8
9	WARD 9
10	WARD 10
11	WARD 11
12	WARD 12
13	WARD 13
14	WARD 14
15	WARD 15
16	WARD 16
17	WARD 17
18	WARD 18
19	WARD 19
20	WARD 20
21	WARD 21
22	WARD 22
23	UNKNOWN

EXHIBIT II-3

EXAMPLE PROPERTY SALE RECORD

This description of a property conveyance is provided by HMS-SALES in response to a user's LIST ALL (LA) command. The system responds promptly through an on-line desk top terminal in the user's office.

APNO	ASSESSORS PARCEL NUMBER	5885
BP	BOOK & PAGE NUMBER	8802/590
ADRES	PARCEL ADDRESS	253 SHAWMUT
NBOR	NEIGHBORHOOD	BO BOSTON
PD	PLANNING DISTRICT	06 SOUTH END
TSVAL	TOTAL ASSESSED VALUE	6500
SQFT	PARCEL SQUARE FEET	1214
SELER	PROPERTY SELLER NAME	GOON
BUYER	PROPERTY BUYER NAME	ABOUJAOUDE
PRICE	TOTAL SALES PRICE	26000
AMORT	ASSUMED MORTGAGE	20000
MORT	MORTGAGE	0
MORTE	MORTGAGEE	U UNKNOWN
CLASS	PROPERTY CLASS	RC MIXED RESIDENTIAL/COMM.
DATE	DATE SALE RECORDED	75/07/24
TYPE	TYPE OF SALE	P PRIVATE

The "Green Cards" were printed on a remote computer terminal by a program accessing the SALES file. This provides a means for updating the historical time series of Appraisers' Weekly cards maintained in some City and BRA departments. These hard copy file cards can serve to support traditional methods.

LOCAT.	253 SHAWMUT	; BOSTON	75
WARD	3	P.D.	6
SELLER	GOON	BUYER	ABOUJAOUDE
AREA	1,214 SQ. FT.	DESC.	MIXED
PRICE$	$6,000	A.V.$	$6,500
	SM $20,000		
MTGE.$		MTGEE.	
DATE	7/24/75	SOURCE	8802/590 (5885.0000)

BOSTON REDEVELOPMENT AUTHORITY 1

An Overview of the SALES System

When we view SALES as a functioning system we see that it consists of the entire process of identifying, locating, collecting, recording, and reporting property sales information. HMS-SALES is a computer tool designed to improve the recording and reporting stages. An interactive information management system, its use requires neither the intermediation of punched cards nor the intervention of computer room personnel. The user can get results immediately. Much versatile programming and documentation are integral to the system, so that the levels of effort, expertise, and expense needed to operate it are minimized. These advantages extend through data input, listing, and correction operations to file search and report preparation.

HMS systems such as SALES are self-documenting. The user can access this documentation by typing "?" at any step. Further help and a complete list of options can be had by typing "??". Appendix B at the end of this chapter is an Introductory User Manual for HMS-SALES. It is preceded by Appendix A, a Technical Description of HMS.

The heart of HMS-SALES is the structured file pictured in Exhibit II-4. The structure allows us to locate an existing record of sale with a minimum of time and expense. The amount of material that we must "leaf through" in order to find the information we want is reduced by a logical ordering of ring structures. The virtues of this approach can best be appreciated by considering the alternative that is both easiest to create and hardest to use: a linear stream file. In a stream file all of the descriptive elements

(facts, names, numbers) pertaining to all records (in this case, properties sold) are stored one after another in the order they were put in. If we look for a particular record (perhaps the sale from Smith to Jones of a single family home in the Charlestown Ward during 1976) we must examine each record one by one from the beginning until we find the string of elements that represent the sales record we seek. If we access all records with equal frequency we will, on average, look through half of them to find the one we want. We have 23,475 property sale records; half of that is 11,738. If we seek a collection of records with unknown size (such as all single family homes in Charlestown sold in 1976) we must read through the entire list (presently 23,475 long) to be sure we don't miss any.

The hierarchic structure of SALES organizes the file by the criteria most useful for input and access: first by year, then by ward, then by property sale. Searching for a particular sale record where all years, all wards, and then all sale records are in equal demand would require an average of 104 steps.* This compares favorably with the average of 11,738 steps required in a stream oriented file of this size. Searching for every property sale meeting some criteria within one chosen year and ward would require an average of approximately 193 examination-comparison steps** rather than the

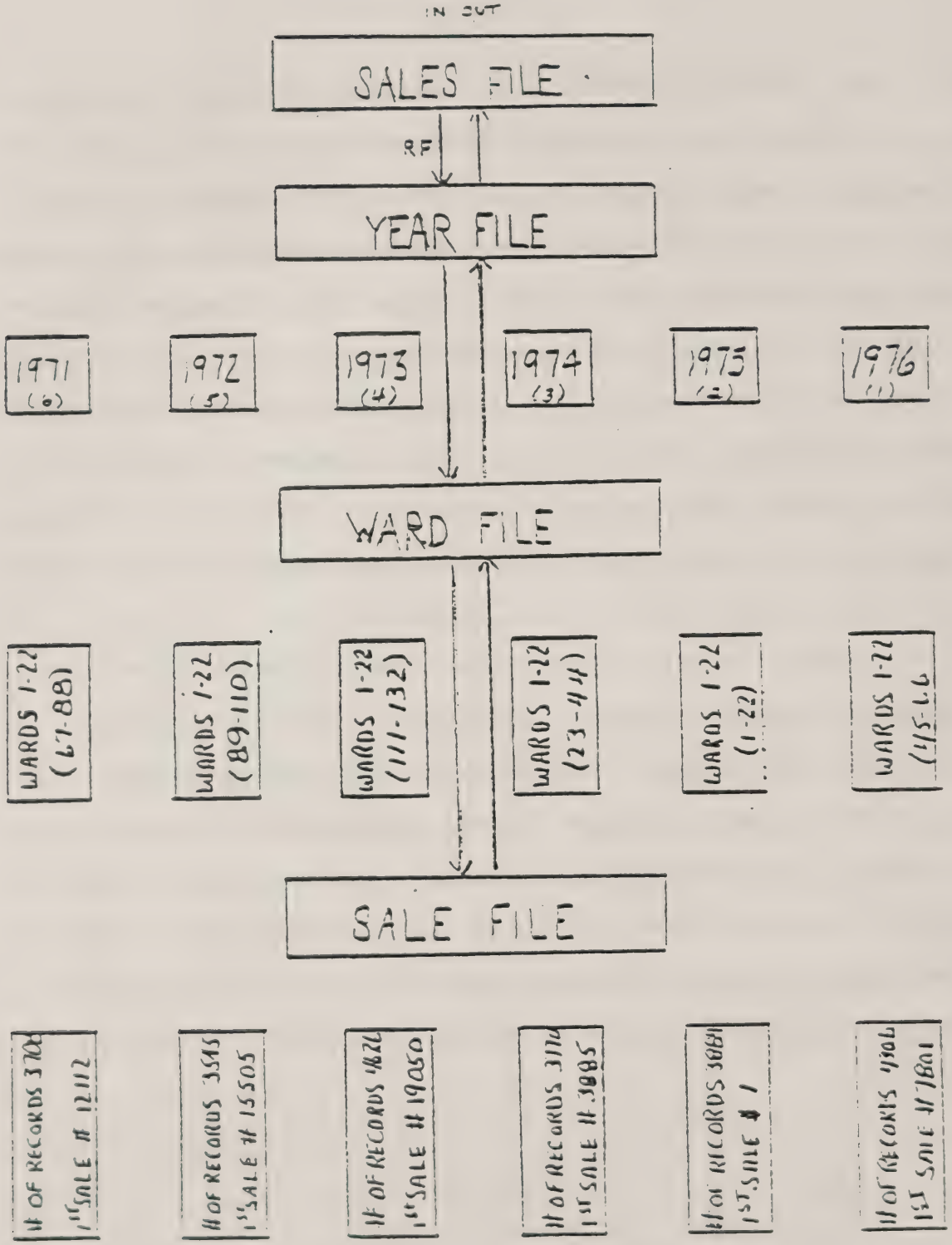
---

* To choose the desired year from six available requires an average of 3.5 steps, from 22 wards 11.5 steps, from an average of 177.8 sale records per ward per year 88.9 steps. 3.5 + 11.5 + 88.9 = 103.9. Of course this is only an estimated average. The true average depends upon the weights imparted to ward and year selection by the distribution of sales within wards and years.

** 3.5 + 11.5 + 177.8 = 192.8. Again an estimate.

Exhibit II-4

SALES SYSTEM FILE STRUCTURE



TOTAL RECORDS 97-76 23,475

23,475 needed to comb the stream file.

Perhaps the most significant virtue of a suitably designed structured file is its usefulness as a nucleus for a conversational, "programmerless" information system. That is, the programs written for HMS-SALES by the HMS Builder (the builder is a program that writes programs* for systems such as HMS-SALES) allow a non-expert user to learn and perform many data entry, search, and report tasks without having to write any programs. Specially programmed analysis or interface with other computerized data sets may be essential to some purposes; but we cannot enjoy any of the advantages of computerized analysis and record keeping without first passing the stages of data entry, review, and correction. These standard operations are usually as costly and time consuming as they are unavoidable, and it is here that an information management system can be of special value.

Data Recording

Computerized record keeping no longer requires the expensive and time-consuming steps of coding forms, punching cards, and programming input. The SALES system accepts direct entry from an on-line terminal without special formating. The system prints a request such as "ENTER THE ADDRESS" and the user simply types in the address. There are a few conventions on the use of punctuation and abbreviations that must be observed, but the clerk-typist needs no prior computer background. The question and answer approach simplifies input and minimizes errors of omission. The default specification option is another aid to data recording. A frequently occurring response to any of the system's input questions can be listed as a default response and signaled by a carriage return.

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* In PLI language.

HMS Systems are "crashproof". Records are stored in such a way that if the computer should cease normal operations (crash) during an update or a build record operation (usually the most crash-sensitive operation), the worst that can happen is that the new information for the record being processed will not be in the system when normal operations resume. All other records and data remain intact and valid.

The use of a computerized system to assist initial data collection and printing of the State forms would streamline clerical tasks while providing the City with up-to-date information. A computer-assisted process would also improve standardization and completeness of record keeping. An important part of data gathering strategy should be the collection of all relevant data from each individual source at one time. This would avoid backtracking and search duplication.

Once data input is completed the value of our property sales information can be further enhanced by computerized geocoding and merger with other property specific records. The Property Equalization Office has succeeded in using the computerized DIME FILE to ascertain census block group and city precinct from ward and street address. By including the property Ward and Assessor's Parcel Number in our records, we can subsequently merge the sales data with tax billing and delinquency files and with Equalization Office property survey results.

HMS-SALES Reports

SALES has a built-in report generating capacity. Tell it what to look for (e.g.: 1976 commercial property sales in Ward 3 with a purchase price of $200,000 or more) and what to print (e.g.: system record number, address, assessment, seller and buyer, type of sale, and price). This report is shown as Exhibit II-5. The operation of telling the system what to look for is called "building a mask" and telling it what to print is called "building a report generator." The procedure is described in the Introductory User Manual (Appendix II-B). This type of simple report is among the more useful for common purposes, such as locating comparable sales, following specific sub-market activity, and detailing the roles played by key marketplace actors. Each transaction that meets the specified criteria is individually listed at the requested level of detail. Several such reports* are contained in Volume 3 of this report: Technical Reports and Background Papers.

The report feature will also sum numeric elements, providing the total, mean, minimum, and maximum values. For coded elements, frequency of occurrence and the percentage of total occurrence for each code will be listed. Exhibit II-6 illustrates the sum and summary facility of the SALES report generator. The 4,306 single property sales that took place in Boston

* This collection of reports is suggestive of the variety of planning and research purposes that such reports can serve. All are drawn from 1976 sales and are listed by Ward: all residential properties conveyed to HUD or VA, all properties sold to a public authority, condominiums sold for less than $30,000, all industrial properties sold, and properties conveyed to banks.

during 1976 are reported according to the number and percent that were of each coded property class and conveyance type. The total, mean, minimum, and maximum values are reported for assessed values and sales prices, both numeric elements. The continuation of this report, which describes each of the City's 22 Wards individually, is contained in Volume 3. Summary reports of this sort can profile market activity in terms of sales volume (or turnover rates, when compared to the Assessing Department's property inventory), average prices, aggregate assessment/sales ratios, and the extent of default conveyances or public and institutional presence. Individual sub-markets can be defined flexibly and examined separately. A closed ring file structure ensures thoroughness of search.

Since SALES reports can be prepared on line with the conversational system and without additional programming, time and expense requirements are low, overcoming two of the greatest obstacles to the use of information for management, research, and planning purposes. Report preparation can also be used to enhance quality and economy in data collection and recording. A report can serve as an editing, correcting, or completion list of current unknown elements. Unusual observations can be found and examined. Where data is recorded at the point of collection, reports can facilitate collection from subsequent sources.

Exhibit II-5

1976 WARD 3 COMMERCIAL PROPERTIES SOLD OVER $200000

8273
ADDRESS: 6-12 NORTH 1-13 UNION ST
CLASS: COMMERICAL
ASSESSED VALUE: 351000
SELLER: SALETTA
BUYER: MILLER
TYPE: PRIVATE
PRICE: 1025000

8293
ADDRESS: 181-83 STATE 78-80 CENTRA
CLASS: COMMERICAL
ASSESSED VALUE: 60000
SELLER: BRUNO
BUYER: STATE ST ASSOC
TYPE: PRIVATE
PRICE: 240000

8304
ADDRESS: 147 TREMONT, 47-57 WEST
CLASS: COMMERICAL
ASSESSED VALUE: 200000
SELLER: VALERIO, M. & H.
BUYER: PAPA GINO'S OF USA
TYPE: PRIVATE
PRICE: 300000

8307
ADDRESS: 422-424 WASHINGTON ST.
CLASS: COMMERICAL
ASSESSED VALUE: 172000
SELLER: STATE ST. BANK & T
BUYER: FEDERATED DEPT ST
TYPE: BANK - PRIVATE
PRICE: 375000

8308
ADDRESS: 523-525 WASHINGTON ST.
CLASS: COMMERICAL
ASSESSED VALUE: 185000
SELLER: HANOVER ST HOLDING
BUYER: THEATRE WORKSHOP
TYPE: PRIVATE
PRICE: 350000

8315
ADDRESS: 22+24 SUMMER ST.
CLASS: COMMERICAL
ASSESSED VALUE: 494000
SELLER: ANDERSON, P.JANICE
BUYER: FEDERATED DEPT. ST
TYPE: PRIVATE
PRICE: 750000

1 WARD OF SALE

6 PROPERTY SALE

Exhibit II-6

CITY OF BOSTON PROPERTY SALES 79/10/24 09.13

1976 SUMMARY

22 WARD OF SALE

4306 PROPERTY SALE

PROPERTY CLASS	#	%	
	1244	28.9	ONE FAMILY
	810	18.8	TWO FAMILY
	896	20.8	THREE FAMILY
	431	10.0	APARTMENTS (4+)
	311	7.2	CONDOMINIUM
	99	2.3	MIXED RESIDENTIAL/COMM.
	176	4.1	COMMERICAL
	96	2.2	INDUSTRIAL
	206	4.8	LAND
	37	0.9	UNKNOWN

TYPE OF SALE	#	%	
	2982	69.3	PRIVATE
	1	0.0	PRIVATE - NUTS
	316	7.3	PRIVATE - PRICE PROBLEM
	5	0.1	PRIVATE - CITY
	14	0.3	PRIVATE - AUTHORITY
	77	1.8	PRIVATE - HUD/VA
	120	2.8	PRIVATE - BANK
	15	0.3	PRIVATE - INSTITUTIONAL
	73	1.7	CONVENIENCE SALE
	177	4.1	FAMILY SALE
	1	0.0	CITY - AUTHORITY
	5	0.1	CITY - INSTITUTIONAL
	244	5.7	CITY - PRIVATE
	12	0.3	AUTHORITY - PRIVATE
	2	0.0	HUD/VA - HUD/VA
	2	0.0	HUD/VA - INSTITUTIONAL
	134	3.1	HUD/VA - PRIVATE
	29	0.7	BANK - HUD/VA
	1	0.0	BANK - INSTITUTIONAL
	70	1.6	BANK - PRIVATE
	6	0.1	STATE - PRIVATE
	3	0.1	INSTITUTIONAL-INSTITUTION
	2	0.0	INSTITUTIONAL - HUD/VA
	1	0.0	INSTITUTIONAL - BANK
	14	0.3	INSTITUTIONAL - PRIVATE

	Total	Mean	Min.	Max
TOTAL ASSESSED VALUE	54847722	12737.5	0	625
TOTAL SALES PRICE	186509858	43313.9	0	3654

HIST: Descriptive Statistics and Graphic Display of Sales Data

Within each of Boston's twenty-two wards and for the entire City, HIST describes property sales for each of eight property types whenever at least five valid and complete arms-length market sales (transaction code "P") occurred. Histogram graphs detail the distribution of both sales prices and assessment/sales ratios, showing the number and percent of properties in each of five magnitude categories. The middle category is centered about the sample mean and the inner three categories each have a range of twenty percent of the sample mean value so that all distributions are uniformly pictured in terms of the Coefficient of Dispersion about the Mean. The two outer categories are open ended. In addition to the sample size (of valid market sales) and sale universe size (of total property conveyances), the following measures are printed for each of sales price, assessed value, and A/S ratio: range, mean, standard deviation and median. For A/S ratios the value weighted mean and standard deviation as well as the Coefficient of Dispersion about the Median are also printed. HIST processes data from the HMS-SALES structured file.

HIST provides us with the sample averages that we need to summarize our data and make inferences about Boston's property values and equalized taxes. At the same time, it illustrates the diversity that these averages mask and points out the uncertainties inherent in making inferences about the diverse populations from which our samples are drawn. Examining the HIST reports exhibited in the following pages, we see that the average property is often the exception rather than the rule. We have a better view of our samples by looking at them from within. A still finer level of

detail can be had by inspecting individual properties drawn from within the five pigeon holes defined in our graphs.

The graphs also point out the pronounced degree to which our data often fail to conform to a normal statistical distribution. A great many of the distributions are neither symetrical nor unimodal. Consequently they do not lend themselves to standard parametric analyses. We cannot draw good confidence intervals about inferential estimates using measured variances and sample sizes. Non-parametric tests of correlation, differences, etc. are available,* but we are generally content to rely on a simple descriptive approach.

The first histogram presented (Exhibit II-7) is annotated as a guide to reading the graphs. Remember that the sales price or assessment/sales ratio axes are specially fitted to each sample so that the only comparisons among wards that we can make by simple superimposition of graphs are for relative dispersions about the means. The descriptive statistics printed by HIST complement the information contained in the graphs. The range shows the lowest and highest values in each sample. The mean or common average is just the sum of all values divided by the number of observations.

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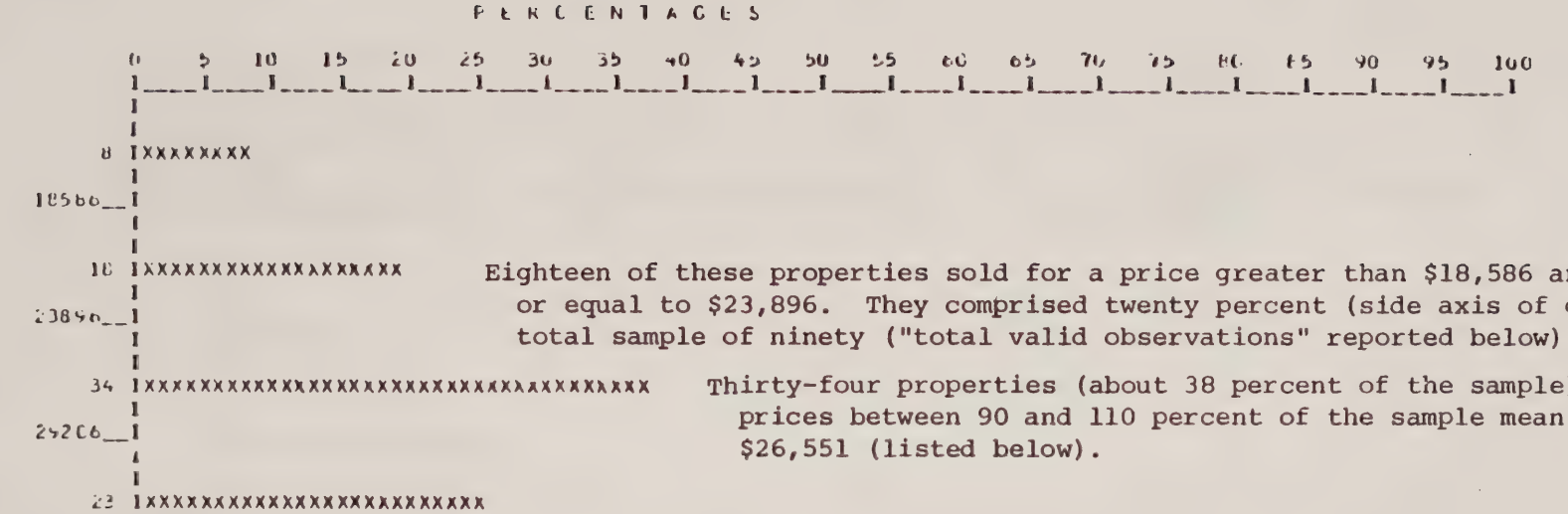
* An excellent guide to both parametric and non-parametric analyses appropriate to these data is "Improving Real Property Assessment-A Reference Manual"; International Association of Assessing Officers; 1978; Chapter 5. Some applications to actual data are demonstrated in "Analysis of Differences in Residential Property Assessment Ratios Within Assessment Jurisdications" by Walter Bretz and Ted Miller; Granville Corporation, Washington, D.C.; awaiting publication.

WARD 18 CLASS(ES): R2
1975 SALES PRICE



Eighteen of these properties sold for a price greater than $18,586 and less than or equal to $23,896. They comprised twenty percent (side axis of graph) of the total sample of ninety ("total valid observations" reported below) properties.

Thirty-four properties (about 38 percent of the sample) sold at prices between 90 and 110 percent of the sample mean value of $26,551 (listed below).

Seven of the properties (about eight percent) sold for prices exceeding $34,517. Looking to the range of sales prices printed below, we see that the most expensive of these cost $40,000.

TOTAL VALID OBSERVATIONS	:	90		ASSESSED VALUES	
RANGE	:	10,000.000	40,000.000	1,800.000	11,000.000
MEAN SALES PRICE	:	26,551.267		6,352.222	
STANDARD DEVIATION	:	5,823.777		1,571.918	
MEDIAN SALES PRIC	:	27,000.000		6,500.000	

Exhibit II-8

WARD 10 CLASS(ES): R2
1975 ASSESSMENT SALES RATIO

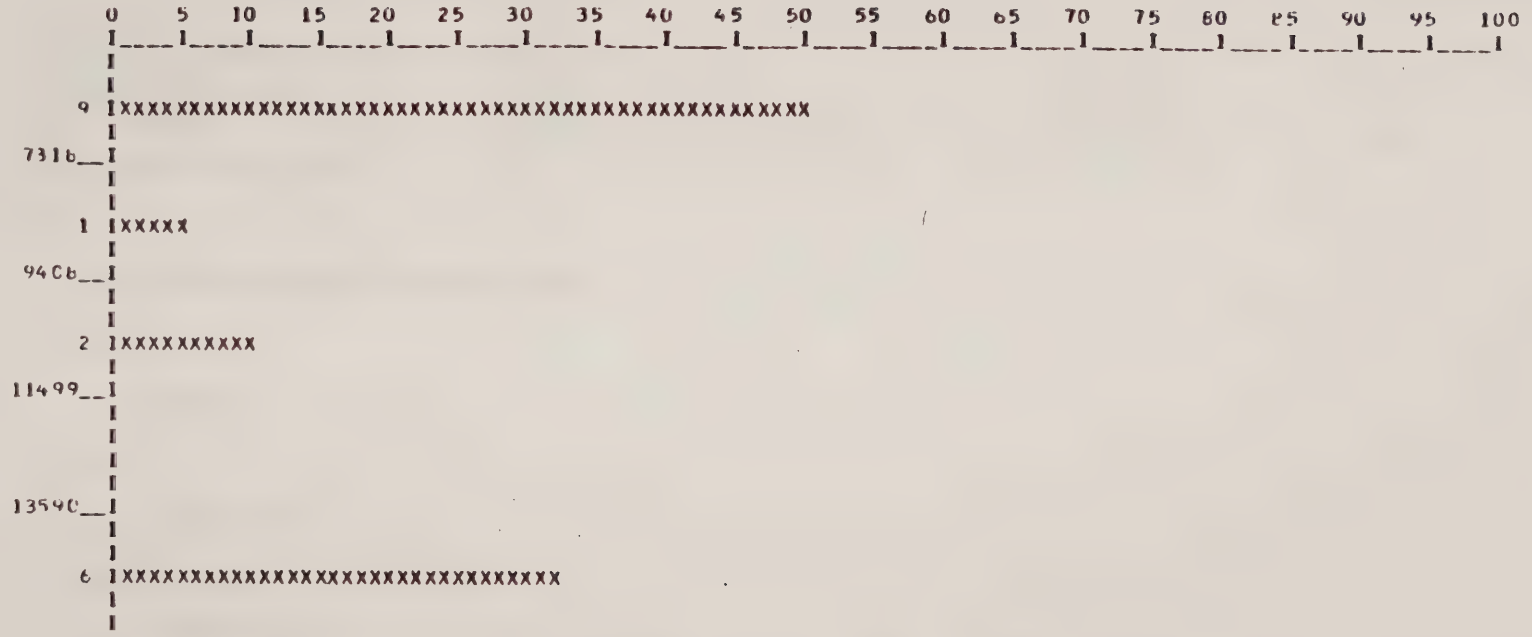
PERCENTAGES

```
          0    5   10   15   20   25   30   35   40   45   50   55   60   65   70   75   80   85   90   95  100
          I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I____I
          I
          I
       10 IXXXXXXXXXX
          I
  0.172__I
          I
          I
       21 IXXXXXXXXXXXXXXXXXXXX
          I
  0.221__I
          I
          I
       33 IXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
          I
  0.270__I
          I
          I
       18 IXXXXXXXXXXXXXXXXXX
          I
  0.319__I
          I
          I
        8 IXXXXXXXX
          I
          I
```

			ASSESSED VALUES	
TOTAL VALID OBSERVATIONS	90			
RANGE	0.096	0.500	1,800.000	11,000.000
MEAN A/S RATIO	0.246		6,352.222	
STANDARD DEVIATION	0.068		1,571.918	
MEAN WEIGHTED A/S RATIO	0.239			
STANDARD DEVIATION	0.060			
MEDIAN A/S RATIO	0.241		6,500.000	
COEFFICIENT OF DISPERSION	20.595			

WARD 13 CLASS(ES): R1
1975 SALES PRICE

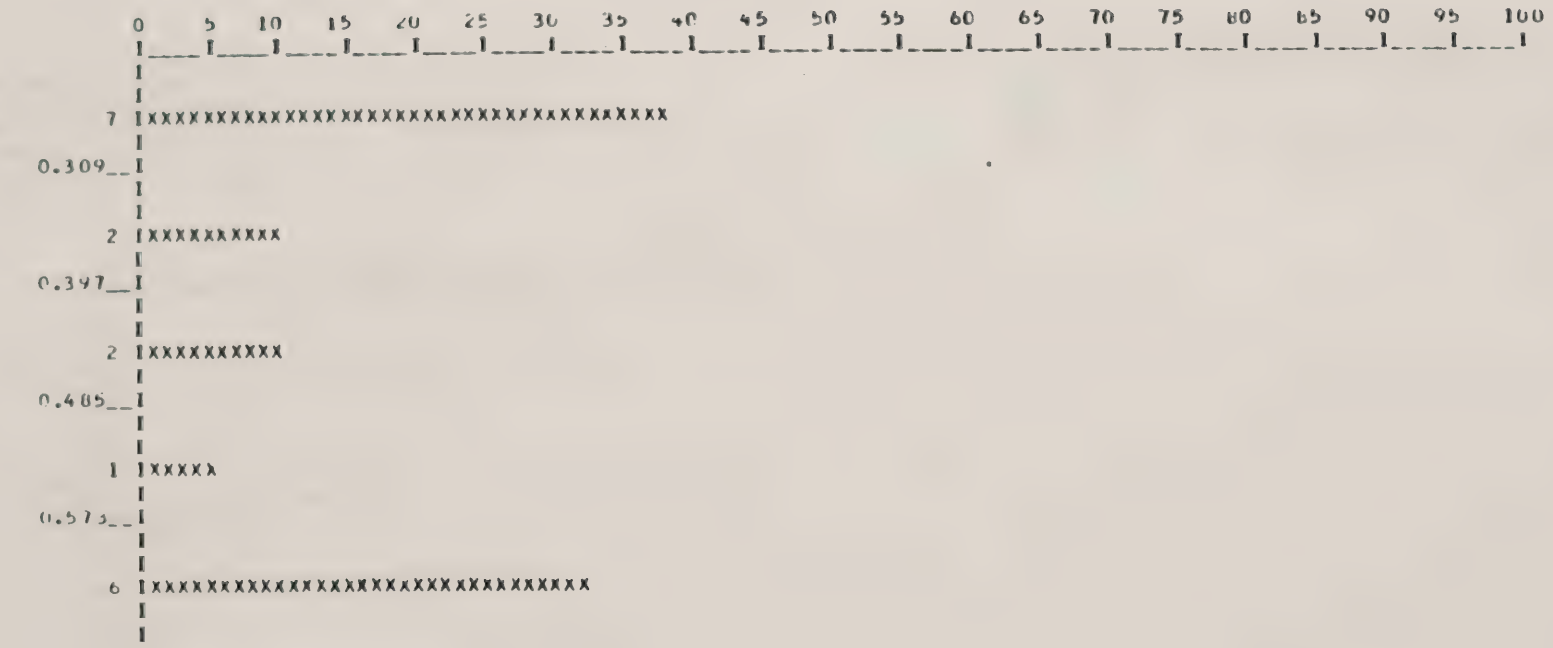
PERCENTAGES



TOTAL VALID OBSERVATIONS	:	18		ASSESSED VALUES	
RANGE	:	2,000.000	23,500.000	1,000.000	6,400.000
MEAN SALES PRICE	:	10,455.667		3,211.111	
STANDARD DEVIATION	:	7,295.755		1,441.633	
MEDIAN SALES PRIC	:	6,500.000		3,000.000	

Exhibit II-10

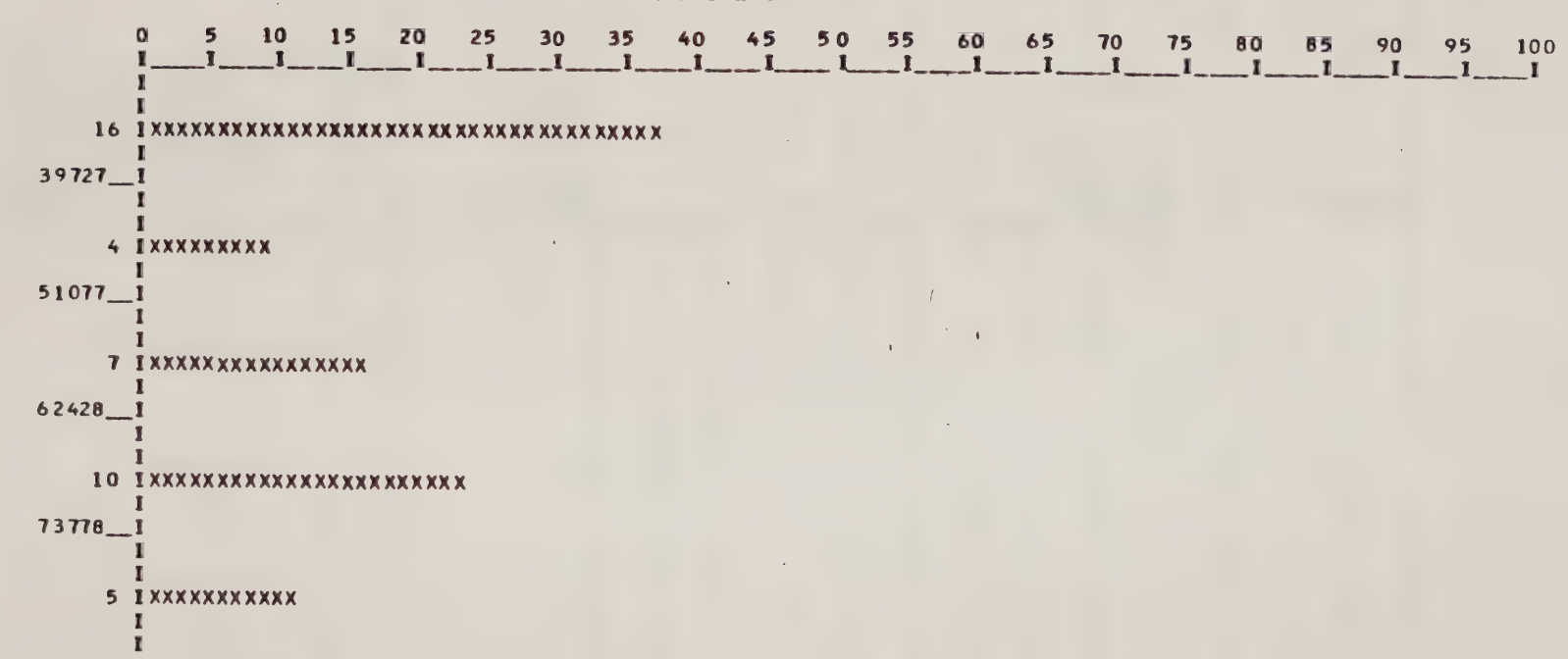
WARD 13 CLASS(ES): R1
1975 ASSESSMENT SALES RATIO



TOTAL VALID OBSERVATIONS :	18		ASSESSED VALUES	
RANGE :	0.128	1.275	1,000.000	6,400.000
MEAN A/S RATIO :	0.441		3,211.111	
STANDARD DEVIATION :	0.309		1,441.633	
MEAN WEIGHTED A/S RATIO :	0.307			
STANDARD DEVIATION :	0.245			
MEDIAN A/S RATIO :	0.380		3,000.000	
COEFFICIENT OF DISPERSION:	60.408			

Exhibit II-11

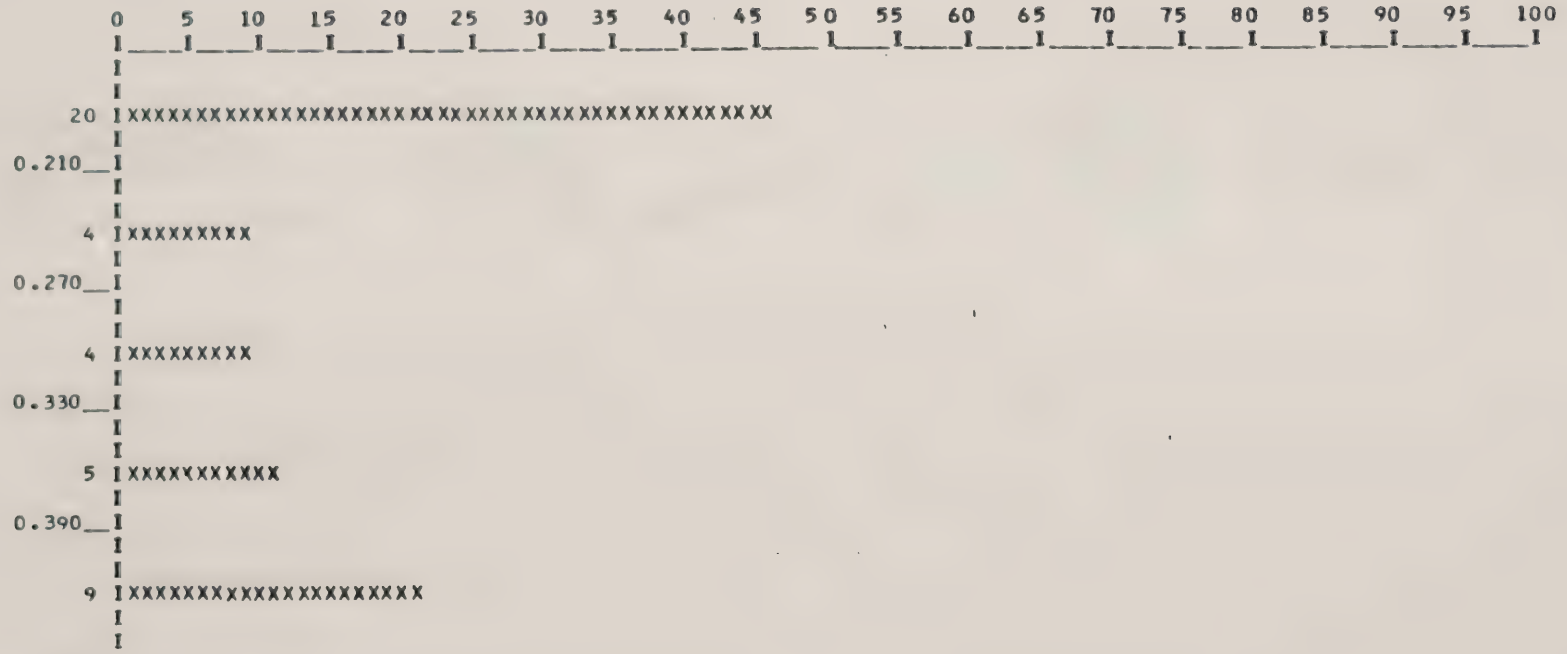
WARD 4 CLASS(ES): R4
1976 SALES PRICE



TOTAL VALID OBSERVATIONS	:	42 (TOTAL SALES:	63)	ASSESSED VALUES	
RANGE	:	13,613.000	325,000.000	4,500.000	54,000.000
MEAN SALES PRICE	:	56,752.357		13,465.404	
STANDARD DEVIATION	:	50,458.143		11,632.415	
MEDIAN SALES PRICE	:	52,500.000		10,000.000	

Exhibit II-12

WARD 4 CLASS(ES): R4
1976 ASSESSMENT SALES RATIO



TOTAL VALID OBSERVATIONS :	42 (TOTAL SALES:		631)	ASSESSED VALUES	
RANGE :	0.069	0.783		4,500.000	54,000.000
MEAN A/S RATIO :	0.300			13,465.404	
STANDARD DEVIATION :	0.208			11,632.415	
MEAN WEIGHTED A/S RATIO :	0.237				
STANDARD DEVIATION :	0.162				
MEDIAN A/S RATIO :	0.215			10,000.000	
COEFFICIENT OF DISPERSION:	73.156				

The sample standard deviation is a measure of dispersion about the mean, but it is not very useful for distributions that do not rise fairly evenly from both sides to a single high point near the center of the graph (i.e., not unimodal and fairly symetrical). The median is another form of average. It shows the middle value that has an equal number of observations both higher and lower than it. For an even number of observations, we will have two values in the middle (having ordered them from lowest to highest) and the median is then the mean of these two. Unlike the mean, the median is not affected by extreme values. The median doesn't care how high the highest value is or how low the lowest is; it simply shows which value is in the middle of an ordered list. The coefficient of dispersion (COD) about the median is printed for assessment/sales ratios. The COD is commonly used as a measure of assessing uniformity. It is the mean percentage difference between individual ratios and their median. If the median ratio were .25 and the COD were 20 this would indicate that on average the individual ratios were .05 above or below the .25 standard (20 percent of .25 is .05). The formula for calculating the coefficient of dispersion about the median is:

$$COD = \frac{100}{NR} \sum_{i=1}^{N} \left| r_i - R \right|$$

where

R is the median assessment/sales ratio
N is the sample size
r_i are the individual ratios for each of the N properties

and $\left| \quad \right|$ the lines mean 'absolute value" -- i.e., we throw away any minus signs and sum the magnitudes of differences.

A final and very important facet of the HIST reports that we should consider is the presentation on each assessment/sales ratio page of two different mean ratios. We must understand their meanings and uses before using HIST to estimate property values. The mean weighted A/S ratios are more properly called "mean value-weighted assessment/sales ratios". They should not be confused with the "mean assessment/sales ratios". Both of these measures are averages, but they average in different ways. One way to grasp the difference intuitively is to imagine the averages as being elected by a poll. For the mean A/S ratio the rule is: one property, one vote. For the value-weighted ratio the rule is: one dollar of market value, one vote.

Let us consider the way these statistics are calculated. For the mean assessment/sales ratio we first divide each property's assessed value by its market value. Then sum all of these individual ratios and divide by the number of properties. The formula for the mean value-weighted assessment/sales ratio is:

$$\frac{s_1 \ (a/s)_1 + s_2 \ (a/s)_2 + s_3 \ (a/s)_3 + \ldots\ldots s_n \ (a/s)_n}{s_1 + s_2 + s_3 + \ldots\ldots s_n}$$

where

$(a/s)_1, (a/s)_2, (a/s)_3, \ldots (a/s)_n$ are the individual assessment/sales ratios of properties 1,2,3,....n

and

$s_1, s_2, s_3, \ldots s_n$ are the sales prices of properties 1, 2, 3, ...n

Each property's individual A/S ratio is first multiplied by its market value before summing. Clearly, properties with greater value have greater 'weight", a louder voice with which to vote. The weighted sum is then divided by the total sales value of all properties in the sample.

Note that all the sales values in the numerator of our formula for the mean value-weighted ratio can cancel out. The formula is equivalent to total assessments divided by total value. This is just the measure we need to deal with aggregate tax base issues. Total assessment is our present tax base and total value is our potential (sometimes called our "real") tax base. The mean value-weighted ratio can also be calculated or interpreted as the average assessment divided by the average value. To see this, picture the ratio as total assessment over total value. We can multiply both the numerator and the denominator by the same number without changing the ratio. Multiplying the 1/n (n is the number of properties) changes the totals to averages. We will soon be using this statistic in our search for average values.

Here is an illustrative sample comparing these two measures: the four houses on Easy Street are sold and we wish to calculate the two ratios we have discussed. The assessments, prices, and individual A/S ratios are:

Property	A	B	C	D	Simple Mean
Assessment	$ 7,000	$ 6,700	$ 5,500	$ 4,800	$ 6,000
Price	40,000	27,000	25,000	16,000	27,000
A/S	.175	.25	.22	.30	.236

Calculating the mean value-weighted Assessment/Sales ratio as average assessment divided by average price gives $6,000/$27,000 = .222. The weighted average ratio is smaller than the average Assessment/Sales ratio of .236. We could have expected this since the most valuable property has the lowest individual A/S ratio and the least expensive house has the highest.

For most classes of property in most Boston wards the weighted mean ratio is lower than the simple mean ratio. This indicates that the more valuable properties tend to be assessed at lower fractions of market value. One reason for this, as we will see in Chapter III, may be that assessments have not kept pace with differently changing values. With static assessments a declining value means a rising A/S ratio while market appreciation lowers the ratio. Be that as it may, a comparison of these two types of average is informative. Each of these measures is also useful in itself. The mean value weighted ratio is especially helpful when our topic is total or average values or assessments. The simple mean ratio is often used as a standard of fairness or when considering the "average" property and its taxes.

Here are the formulae for calculating the standard deviations about the two mean ratios we have considered. For the sample standard deviation from the simple mean:

$$\text{st. dev.} = \sqrt{\frac{N}{N-1}\left[\frac{\sum r_i^2}{N} - \left(\frac{\sum r_i}{N}\right)^2\right]}$$

And the standard deviation from the value weighted mean ratio:

$$\text{st. dev.} = \sqrt{\frac{\sum(r_i^2 s_i) - 2R_w \sum r_i s_i}{S} + R_w^2}$$

where N = sample size

r_i = assessment sales ratios for individual properties (i = 1 to N)

s_i = sales prices for individual properties (i = 1 to N)

R_w = the weighted mean ratio for the sample

and S = the total sales price of sample ($S = \sum s_i$)

Estimating Boston's Tax Base: 1978

Estimating the Values of Boston's Small Residential Properties

The values of Boston's one-, two-, and three-family homes were estimated from sales price and assessment data contained in the SALES information management system and digested by HIST analysis. The resulting estimates of 1975 values were then inflated to 1978 levels using the 1955-1979 Residential Value Index that is described in the following chapter and listed in Appendix III-B. Small sample sizes and high variances prompted us to employ special methods in the estimation of both 1975 values and the subsequent inflation adjustment.

While the turnover rates for one-, two-, and three-family homes in Boston averaged 4.8 percent, 5.1 percent, and 6.7 percent, respectively, in 1975, the proportions of existing stock sold were significantly lower in some individual wards. See the table "Boston Real Estate Turnover 1975" in Appendix II-C. Sample sizes were further reduced by high proportions of unacceptable sales in some instances. The percentage of conveyances involving banks, the City, HUD, or the BRA exceeded twenty percent in eight of the twenty-two wards. See the table "1975 Real Estate Sales Summary Sheet" in Appendix II-C. Even in some wards with respectable sample sizes of useable sales, variances about mean assessment to sales price ratios were sometimes quite large, as shown in the HIST analyses included earlier in this chapter and in Chapter 4 of Volume I and Chapter 6 of Volume III.

As a means to increase our effective sample sizes and reduce the expected errors of our estimates we expanded our investigation to cover the years 1974, 1975, and 1976. We first calculated the weighted average assessment to sales price ratios for each property type in each ward for each year. This aggregate ratio is the instrument of choice for estimating aggregate values, as

explained previously. We then took the geometric mean of the three annual figures for each property type by ward and adopted these averages as our estimates of 1975 ratios, as recorded in Table II-1. The geometric mean is a preferable average in most time-series applications. Finally, we divided the average assessed value of each property type by ward (as found in City Assessing Department records) by the corresponding "smoothed" ratio to arrive at our estimates of average 1975 market values. The results appear in Table II-2. At each step condominiums were excluded and reserved for separate treatment.

The Residential Value Index (RVI) was employed to inflate our estimates of 1975 values to 1978 levels. This Index is described in detail in the following chapter, and the series we used here is explained and listed as Appendix III-B. The RVI reports average proportional changes in residential sales values, from period to period, within each of Boston's wards. "Period to period" usually means annually, but data deficiencies for 1976, 1977, and 1978 forced us to jump directly from 1975 into the first half of 1979 (the last six months of 1979 were also not a great vintage for useable data).

In addition to the "missing years" problem, our RVI presented us with other technical difficulties. Each series tends to be weakest at its end points, and both 1975 and 1979 constituted end points as calculated. We took advantage of the fact that average residential values changed very little during the 1973-1975 period to iron out random fluctuations within the 1975 estimates. Taking the geometric mean of the 1973, 1974, and 1975 index numbers for each ward, we first calculated a set of "smoothed 1974" figures. Examination of the series listed in Appendix III-B reveals few discernible trends during that time, and so we then attributed the "smoothed 1974" results to 1975 also, for each ward. From 1975 to 1979, the various individual RVI trends that

Table II-1

WEIGHTED ASSESSMENT/SALES RATIOS FOR ONE, TWO, AND THREE FAMILY HOMES

Ward	One Family			Two Family			Three Family		
	1974	1975	1976	1974	1975	1976	1974	1975	1976
1	.162	.164 .161*	.158	.171	.188 .174*	.164	.216	.220 .220*	.224
2	.152	.104 .123*	.118	.126	.130 .134*	.148	.213	.141 .154*	.121
3	.165	.193 .178*	.176	.175	.174 .183*	.202	.203	.274 .231*	.221
4	.208	.172 .163*	.120	.216	.165 .181*	.166	.216	.239 .205*	.168
5	.222	.249 .216*	.183	.229	.235 .229*	.223	.253	.233 .237*	.225
6	.184	.176 .177*	.170	.181	.196 .184*	.175	.216	.221 .223*	.232
7	.255	.128 .173*	.160	.176	.207 .204*	.233	.287	.314 .287*	.262
8	.315	.370 .310*	.257	.373	.395 .396*	.420	.667	.312 .424*	.366
9	.202	.286 .247*	.260	.175	.162 .285*	.814	.407	.412 .323*	.201
10	.245	.281 .249*	.225	.344	.304 .331*	.346	.370	.352 .364*	.371
11	.245	.310 .268*	.253	.301	.365 .311*	.273	.399	.408 .407*	.413
12	.309	.672 .395*	.297	.297	.332 .342*	.407	.387	.426 .490*	.713
13	.322	.307 .301*	.275	.265	.351 .312*	.326	.407	.493 .444*	.437
14	.295	.234 .271*	.288	.319	.438 .380*	.394	.478	.528 .493*	.474
15	.322	.298 .305*	.295	.292	.298 .319*	.373	.443	.473 .458*	.458
16	.248	.216 .230*	.227	.262	.275 .265*	.258	.325	.351 .337*	.337
17	.291	.259 .267*	.252	.315	.296 .298*	.285	.389	.380 .372*	.348
18	.207	.202 .202*	.197	.236	.239 .236*	.232	.275	.265 .270*	.270
19	.218	.211 .210*	.200	.240	.284 .256*	.246	.286	.306 .300*	.309
20	.187	.192 .188*	.186	.214	.208 .217*	.230	.224	.208 .231*	.263
21	.197	.171 .179*	.171	.193	.209 .201	.201	.216	.223 .229*	.250
22	.188	.169 .172*	.159	.181	.195 .182*	.171	.195	.252 .217*	.209

* Geometric Mean.

Table II-2

MARKET VALUES AND ASSESSED VALUES OF BOSTON'S
ONE, TWO, AND THREE FAMILY HOMES, BY WARD, 1975

WARD	TOTAL ASSESS/TOTAL VALUE RATIO			NUMBER TAXABLE PROPERTIES			AVERAGE MARKET VALUE			AVERAGE ASSESSED VALUE		
	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
1	.161	.174	.220	939	1,348	2,172	$20,752	$23,126	$20,741	$3,341	$4,024	$4,563
2	.123	.134	.154	881	539	498	$21,260	$23,664	$28,818	$2,615	$3,171	$4,438
3	.178	.183	.231	95	61	215	$33,624	$27,546	$30,740	$5,985	$5,041	$7,101
4	.163	.181	.205	302	58	172	$40,982	$60,204	$55,893	$6,680	$10,897	$11,458
5	.216	.229	.237	524	75	140	$77,148	$72,223	$75,637	$16,664	$16,539	$17,926
6	.177	.184	.223	956	772	720	$13,350	$18,549	$21,596	$2,363	$3,413	$4,816
7	.173	.204	.287	717	755	1,304	$15,578	$20,069	$17,547	$2,695	$4,094	$5,036
8	.310	.396	.424	200	222	397	$10,910	$9,343	$10,778	$3,382	$3,700	$4,570
9	.247	.285	.323	122	92	178	$10,587	$15,074	$14,307	$2,615	$4,296	$4,621
10	.249	.331	.364	247	326	763	$18,064	$19,344	$16,588	$4,498	$6,403	$6,038
11	.268	.311	.407	481	564	949	$13,978	$14,537	$14,744	$3,746	$4,521	$6,001
12	.395	.342	.490	424	546	651	$9,446	$14,465	$12,812	$3,731	$4,947	$6,278
13	.301	.312	.444	672	565	1,108	$12,651	$14,548	$13,405	$3,808	$4,539	$5,952
14	.271	.380	.493	576	1,299	1,722	$13,827	$14,287	$13,207	$3,747	$5,429	$6,511
15	.305	.319	.458	536	624	1,284	$13,033	$15,003	$14,282	$3,975	$4,706	$6,541
16	.230	.265	.337	1,828	1,454	982	$20,161	$23,521	$20,451	$4,637	$6,233	$6,892
17	.267	.298	.372	1,711	1,429	1,004	$17,933	$21,252	$18,927	$4,788	$6,333	$7,041
18	.202	.236	.270	6,915	2,978	613	$22,936	$24,814	$24,885	$4,633	$5,856	$6,719
19	.210	.256	.300	2,005	1,277	690	$29,595	$25,625	$23,063	$6,215	$6,560	$6,919
20	.188	.217	.231	7,637	1,876	351	$30,059	$33,553	$34,450	$5,651	$7,281	$7,958
21	.179	.201	.229	449	588	256	$43,184	$46,870	$50,555	$7,730	$9,260	$11,577
22	.172	.182	.217	1,362	2,101	524	$28,512	$36,868	$35,959	$4,904	$6,710	$7,803
AVERAGES	.201	.234	.309				$24,798	$24,793	$20,159	$4,996	$5,797	$6,228
TOTALS (S MILLIONS)				29,579	19,541	16,693	$733.514	$484.476	$336.52	$147.762	$113.281	$103.969

were earlier evidenced within each ward generally resumed, but often to an exaggerated degree. We believe that this is partly due to relaxed sample selection criteria for 1979 data, necessitated by the brief six month observation period. This is discussed in the section of Appendix III-B titled "Changed Data Rules = Changed Interpretation". We therefore decided to "stabilize" the ward growth rates, 1975-1979, by averaging them with the overall City rate (arithmetic mean). As a consequence, we may have somewhat understated the increase in relative assessment disparity that took place over this period, as related in Chapter 4 of Volume I. Still, it seemed that a conservative method would do less damage to the presentation of a strong substantive case than would possible overstatement of worsening dispersion.

Here is a summary of the steps followed to derive 1978 value estimates for one-, two-, and three-family homes: First, we calculated the percent change from the "smoothed 1974" index number to the first-half 1979 number for each ward. See the first column of Table II-3. We then took the arithmetic mean of each ward's percent change and the overall City percent change and interpreted this as the cumulative ward change from June 1975 to March 1979 (the mid-points of those data periods) - a span of 3.75 years. Next we took the 3.75 root of this decimal percent plus one to arrive at average annual rates of change and then raised this result to the third power to accommodate the three-year period June 1975 to June 1978. These "synthesized" cumulative growths are listed in the second column of Table II-3. Finally we multiplied this last result by the average 1975 values determined earlier to arrive at average value estimates for mid-1978. These appear in Table II-4. The 1978 assessment to value ratios were figured by dividing the average

TABLE II-3

RESIDENTIAL VALUE GROWTH RATES BY WARD
USED TO INFLATE 1975 MARKET VALUES TO 1978 LEVELS
FOR 1-,2-, AND 3-FAMILY HOMES IN BOSTON

WARD	CUMULATIVE % GROWTH SMOOTHED 1974-FIRST HALF 1979	SYNTHESIZED 3 YEAR CUMULATIVE % GROWTH 7/75- 6/78
1	30.30	25.10
2	59.20	35.91
3	61.80	36.88
4	100.10	50.87
5	89.20	46.92
6	29.80	24.91
7	44.50	30.44
8	78.10	42.87
9	78.10	42.87
10	18.40	20.58
11	38.60	28.23
12	- .70	13.23
13	14.20	18.97
14	2.90	14.62
15	20.00	21.19
16	18.20	20.50
17	34.00	26.49
18	16.90	20.00
19	17.60	20.27
20	47.50	31.56
21	31.30	25.48
22	36.50	27.44
CITY	34.30	26.60

NOTE: THE SYNTHESIZED 3 YEAR CUMULATIVE GROWTH RATES EMPLOYED TO INFLAT
1975 AVERACE MARKET VALUES TO 1978 LEVELS WERE CREATED BY:
FIRST AVERAGING THE INDIVIDUAL WARD GROWTH SHOWN IN THE FIRST COLUMN
WITH OVERALL CITY GROWTH, SECONDLY TAKING THE 3.75 ROOT OF THE FIRST RE
PLUS 1, AND FINALLY RAISING THE SECOND RESULT TO THE THIRD POWER.
THIS LAST RESULT, ,MINUS ONE, IS SHOWN IN THE SECOND COLUMN

Table II-4

MARKET VALUES AND ASSESSED VALUES OF BOSTON'S
ONE, TWO, AND THREE FAMILY HOMES, BY WARD, 1978

WARD	TOTAL ASSESS/TOTAL VALUE RATIO			NUMBER TAXABLE PROPERTIES			AVERAGE MARKET VALUE			AVERAGE ASSESSED VALUE		
	R1	R2	R3	R1	R2	R3	R1	R2	R3	R1	R2	R3
1	.129	.139	.176	938	1,345	2,154	$25,960	$28,931	$25,946	$3,345	$4,035	$4,559
2	.092	.099	.114	894	539	497	$28,895	$32,163	$39,168	$2,654	$3,171	$4,458
3	.065	.143	.171	101	61	214	$46,023	$37,704	$42,076	$3,012	$5,397	$7,176
4	.107	.120	.136	303	58	176	$61,827	$90,828	$84,323	$6,588	$10,897	$11,463
5	.120	.155	.160	526	74	141	$113,345	$106,108	$111,125	$13,656	$16,499	$17,803
6	.142	.148	.179	955	766	718	$16,676	$23,169	$26,976	$2,370	$3,427	$4,831
7	.133	.157	.219	714	753	1,305	$20,320	$26,177	$22,088	$2,703	$4,108	$5,019
8	.205	.276	.297	188	215	380	$15,587	$13,349	$15,399	$3,197	$3,689	$4,571
9	.169	.203	.226	125	90	166	$15,126	$21,536	$20,440	$2,552	$4,364	$4,618
10	.204	.274	.302	242	323	755	$21,781	$23,325	$20,001	$4,435	$6,398	$6,038
11	.201	.243	.315	484	563	946	$17,923	$18,640	$18,906	$3,601	$4,523	$5,962
12	.347	.300.	.433	421	552	639	$10,695	$16,378	$14,507	$3,715	$4,918	$6,280
13	.252	.260	.368	661	560	1,094	$15,051	$17,308	$15,948	$3,792	$4,497	$5,873
14	.236	.330	.424	567	1,285	1,665	$15,848	$16,376	$15,138	$3,740	$5,405	$6,421
15	.248	.258	.365	510	606	1,223	$15,794	$18,182	$17,307	$3,923	$4,691	$6,321
16	.190	.218	.276	1,825	1,450	974	$24,294	$20,342	$24,643	$4,615	$6,185	$6,793
17	.208	.230	.280	1,700	1,416	971	$22,684	$26,882	$23,942	$4,725	$6,176	$6,698
18	.168	.195	.223	6,604	2,963	609	$27,523	$29,777	$29,863	$4,625	$5,816	$6,667
19	.176	.212	.250	2,045	1,275	682	$35,594	$30,819	$27,738	$6,267	$6,536	$6,924
20	.142	.165	.176	7,626	1,874	350	$39,545	$44,143	$45,323	$5,628	$7,290	$7,963
21	.145	.163	.183	446	587	257	$54,186	$57,806	$63,434	$7,860	$9,424	$11,611
22	.135	.143	.171	1,358	2,098	527	$36,334	$46,984	$45,824	$4,902	$6,702	$7,830
AVERAGES	.155	.186	.242				$31,691	$31,084	$25,549	$4,926	$5,778	$6,172
TOTALS ($ MILLIONS)				29,233	19,453	16,443	$926.412	$604.670	$420.096	$144.008	$112.393	$101.480

market value estimates into actual 1978 average assessments as reported by the City Assessing Department. Again, condominiums were excluded at each step.

Estimating Boston's Condominium Values and Assessment Ratios

1978 condominium value and assessment ratio estimates were based on 1975 sales data, City Assessing Department records, and the Residential Value Index. The 246 condominiums sold in 1975 and described by HIST were closely grouped about the aggregate assessment/sales ratio of .247, with a standard deviation of only .057. Other measures of central tendency were in close agreement. The unweighted average ratio was .248 and the median was .257. Assessing Department records for that year showed less internal agreement and were more difficult to interpret. Condominiums were not specially coded, and their presence on the tax rolls was signaled only by the absence of recorded land area and a land component for assessed value. A special report prepared for us by the Assessing Department Data Processing Division listed all properties with no associated land area or value as of the end of 1975 (these FY 77 records pertained to January 1, 1976).

This list was cross-checked with Assessing Engineering Division records of master deed filings in an attempt to weed out spurious entries. We believe that the result, showing 1,997 units assessed at $24,741,000 (an average of $12,389) is fairly accurate, but we cannot guarantee this. Dividing the presumed total assessed value by the observed weighted average ratio yielded an aggregate market value estimate of $100,167,000 ($50,159 parcel average) for 1975.

For 1978 we first inflated the 1975 value estimate by 26.6 percent. This Boston average three-year cumulative growth (shown in Table II-3) agrees closely with the experience of ward 3's Lewis Wharf Condominiums, reported in Exhibit III-1 of the following chapter. We conclude that those earlier condos were worth $126,819,000 in mid-1978. We then assumed that the $877,000 of assessed value for 102 condominiums added to the tax rolls for FY 78 was again 24.7 percent of market value. We add this $3,551,000 to the value of "old" condos to arrive at the 1978 real tax base of condominiums. To summarize:

Datum	1975	Source	1978
Number	1,977	Assessing Dept.	1,997 + 102 2,099
Assessed Value ($1,000s)	24,741	Assessing Dept.	24,741 +877 25,618
Market Value ($1,000s)	100,167 =	AV/(A/S) x 1.266 = 877/.247 =	 126,819 + 3,551 130,370
(A/S) Ratio	.247	1975 sales data 25,618/130,370 =	.197

Estimating the Value of Boston's Apartment Properties

Sales data for Boston's apartment properties show a marked disparity of assessing treatment:

Year	Aggregate Mean (A/S) Ratio	Standard Deviation	Sample Size
1974	.289	.148	178
1975	.347	.144	130
1976	.311	.224	268

Furthermore, we believe that these samples are not representative of the population from which they were drawn. Professional opinion held that an atypical proportion of our observations consisted of properties suitable for condominium conversion that were sold at premium prices. Our samples would therefore understate the true assessment-to-value ratio and lead to an overstatement of aggregate value. We chose, therefore, to benchmark our value estimate with the State Department of Revenue "equalized value" estimate (1976 unrevised) that was based on 118 appraisals as well as 354 sales that occurred during 1974 and 1975. While suspicious of the low value findings in most of the state's biennial tax base estimates for Boston, we felt that their preliminary 1976 results were of good quality.

Since the Department of Revenue's data collection period spanned 1974 and 1975, we attributed their full value figure of $497,922,000 (reflecting a 43 percent assessment level) to January, 1975. We inflated this total value estimate over a 3½ year period to mid-1978, and then adjusted for change in the number of apartment properties between FY 76 and FY 78. Evidence that apartments were growing in value more slowly than other residential properties prompted us to assume a 6.5 percent annual rate of value increase, rather than the city-wide 8 percent implied by Table II-3. See the section "Testing for Differences Among Property Types Within a Neighborhood" in the following chapter. In sum:

January, 1975 Value		Adjusted for 3½ Years 6½ % Growth		Change in Number Parcels		June, 1978 Value
$497.922 million	x	1.247	x	.9845	=	$611.084 million

Comparing this aggregate value with the total assessment of $209.341 million for these 7,600 parcels results in weighted assessment/value ratio of 34.26 percent.

Estimating the Value of Boston's Commercial Realty

Commercial value estimates used in this study are based on the economic characteristics of Boston office properties. Table II-5 lists the data employed and their sources. The data listing is arranged to show the derivation of average "per square foot" values for Class A, B, and C downtown office space. We then multiplied these unit values by the amount of office stock, by class, to reach an estimate of total downtown office value. The residual City assessed value was assumed to represent older property that was assessed similarly to Class C offices with respect to value.

We have also assumed that these "residual" properties did not enjoy the abatements received by their downtown counterparts, so their taxes per square foot would be $1.74, as implied by the average Class C assessment, rather than the $1.48 net tax shown in Table II-5. Although this does not effect our estimation of value here, it does influence the simulation of equalization impacts presented in Chapter 5 of Volume I. The derivation of total downtown office and other commercial value is shown in Table II-6.

Commercial property taxes are alternatively measured by taxes per square foot, taxes as a percent of income, effective tax rates, and assessment-to-value ratios. We have included a project working paper that discusses translation among these expressions of tax burden as Appendix II-D following this chapter.

Table II-5

TAXES AND VALUES OF DOWNTOWN BOSTON OFFICE PROPERTIES, 1978

Derivation Of Value		Class A	Class B	Class C
	Gross Rent	$12.35	$7.05	$6.
adjusted for				
	Vacancy %	7.3%	10.2%	19.
equals				
	Effective Gross Income	$11.45	$6.33	$5.
less				
	Operating Costs	$2.83	$2.54	$2.
equals				
	Net Income	$8.62	$3.79	$3.
	Assessed Value	$8.30	$7.85	$6.
times 25.29% tax rate equals				
	Property Tax	$2.10	$1.79	$1.
subtracted from Net Income equals				
	Net Operating Income	$6.52	$2.00	$1.
divided by				
	Capitalization Rate	10%	11%	12%
equals				
	Value	$59.27	$16.67	$12.
	Tax/Effective Gross Income	18.3%	28.3%	26.
	Tax/Net Income	24.4%	47.2%	47.
	Assessment/Value Ratio	14%	47%	54%

Notes: All figures are per gross leasable square foot.
Class A space was built since 1960 and totaled 12.26 million square f of downtown office space.
Class B was built before 1960 but substantially upgraded, and totaled 5.74 million square feet downtown.
Class C was built before 1960, was lower quality, accounted for 16.6 million square feet.
Gross Rent (as of 6/78), Vacancy % (April and October 1978 average), Operating Cost (10/78) are reported from Michael Matrullo, The Offic Industry Survey, Part II, BRA Research, March 1979, Table R1.
Assessed Values and Property Taxes (taxes net of abatements, FY78) we compiled from Boston Assessing Dept. records for Matrullo's survey sample properties by Larson and Westfield, BRA Research.

Table II-6

The Value of Boston Downtown Office and Other Commercial Property: 1978

Class	A	B	C	Total
Value/sq.ft.	$ 59.27	$ 16.67	$ 12.77	
Millions sq.ft.	12.26	5.74	16.61	$ 34.61
Total value ($ millions)	$ 726.650	$ 95.686	$212.110	$1,034.446
Assessment/sq.ft.	$ 8.30	$ 7.85	$ 6.89	
Total assessment ($ millions)	$ 101.758	$ 45.059	$114.443	$ 261.26
(A/V) ratio	14.0%	47.1%	53.8%	

For the remaining $370.397 million of commercial realty assessed value, we applied the 53.8 percent "Class C" assessment-to-value ratio to arrive at a market value of $688.47 million. The City totals were then:

	Assessed Value	Market Value	Ratio
Downtown Office	$261.260 million	$1,034.446 million	25.3%
Other	370.397	688.470	53.8
Total	$631.657	$1,722.916	36.7

NOTE: The estimated size of downtown office stock by Class was reported in The Office Industry Survey, Part II, BRA Research, 1979, by Michael Matrullo. Those figures were adjusted downward for Class A space not completed by 1978. The sources and derivation of other data are described in Table II-5.

Estimating Boston's Personal Property Values

Personal property values are difficult to estimate and they are the subject of much controversy. Taxable personalty consists largely of the equipment, machinery, and distribution lines of utility companies. Much of this, called "certified" personal property, is valued by the state; the tax value of "other" personalty is determined by local assessors. It has been a long-standing practice in Massachusetts to accept the utilities' own value figures, especially for "certified" property; but this has been challenged with increasing frequency and vigor. In March, 1978 Mass. Fair Share issued a report questioning the values established for 769 miles of gas pipelines traversing 140 cities and towns. State officials admitted that the pipelines "probably are undervalued". More recently, in 1983, the town of Watertown challenged the traditional "depreciated net book value" method advocated by Boston Edison Company and proposed instead a reliance on the "depreciated replacement cost" approach to valuation. The town's procedures resulted in a valuation about twice that of Edison's $8 million figure. The initial court finding favored Watertown, but appeals will postpone final resolution until late 1983. The question of whether depreciated net book value represents only a fraction of "full" value as required by law has become more important as Massachusetts municipalities move from fractional valuation to legal compliance.

Anticipating no immediate great change in personal property valuation procedures, from our 1978 perspective, we made two conservative and admittedly arbitrary assumptions for Boston's fiscal year 1978 taxable personal property. We assumed that "certified" property was valued at 90 percent of the level that would be set for it upon equalization. We attributed to "other" personalty the 40.5 percent ratio that we determined for industrial realty.

	FY 78 Assessment	Assumed Ratio	Market Value
Certified	$102.128	.90	$113,476
Other	144.833	.405	357,612
TOTAL	246.961	.524	471.088

Dollar figures are in $ Millions

In hindsight, this seems rather too conservative. Boston's personal property assessments for FY 83, its initial equalization year, were $1,695.4 million. They increased more than six fold over the prior year. Some of this, however, is under appeal. Nonetheless, we have probably understated personalty value and equalized taxes.

Estimating Boston's Land, Industrial, and Mixed Residential/Commercial Values

We lacked the resources to make independent estimates of value for these three types of property that totaled 15.6 percent of Boston's FY 78 assessed value and 16.8 percent of estimated market value. We relied instead on the state's unrevised 1976 Equalized Value estimates. As mentioned in the discussion of apartment values, we feel that this particular set of official estimates was of generally good quality.

Over 40 percent of Boston's taxable vacant land area was to be found in wards 18 and 20 in Fiscal Year 1978. Our survey of 1975 property sales yielded only six useable transactions here. In adopting the State Revenue Department's 1976 value estimate, we noted that their value finding amounted to $3.05 per square foot, somewhat higher than we had observed in most 1974, 1975, and 1976 sales. We kept this unit value with no adjustment for

inflation but increased the total value in proportion to the increase in land area from FY 76 to FY 78 as reported by the City Assessing Department. The result was an aggregate assessed value of $40.325 million, market value of $273.694 million and a ratio of 14.7 percent.

For both industrial and mixed use residential/commercial property we simply inflated the state's 1976 value estimates by 18.62 percent to account for 3½ years (January 1975 to June 1978) of assumed five percent annually compounded growth. Between FY 76 and FY 78 the number of industrial parcels declined by 3.3 percent, assessed value fell by 2.4 percent, but total land area went down by only 1.1 percent. Mixed use properties declined by 3.1 percent in number, .5 percent in assessment, and 2 percent in area. We attempted no adjustment for these minor changes in order to more honestly admit our ignorance. We note in passing that 41 percent of Boston's FY 78 mixed use realty assessed value was to be found in the 532 parcels of ward 3. Our three-year (geometric) mean weighted ratio of sales in this ward, 1974-1976, was 24.3 percent, which compares closely with the 25.5 percent "equalized value" ratio.

The value and assessment ratio estimates that we arrived at for all types of taxable property in Boston are summarized in Table II-7.

Table II-7

BOSTON'S TAX BASE
June 1978

Class	Total Market Value ($ Millions)	Total Assessed Value ($ Millions)	Assessment to Value Ratio %	Number of Parcels	% Market Value Tax Base	% Assessed Value Tax Base
1-Family	926.412	144.008	15.5	29,233	15.8	8.3
2-Family	604.670	112.393	18.6	19,453	10.3	6.4
3-Family	420.096	101.480	24.2	16,443	7.1	5.8
Apartments	611.084	209.341	34.3	7,600	10.4	12.0
Condominiums	130.370	25.618	19.7	2,099	2.2	1.5
Mixed Residential/ Commercial	295.818	63.385	21.4	2,486	5.0	3.6
Commercial	1,722.916	631.657	36.7	5,975	29.3	36.2
Industrial	419.339	169.783	40.5	969	7.1	9.7
Agricultural	.074	.074	100.0	3	-	-
Land	273.694	40.325	14.7	11,404	4.7	2.3
Personal	471.088	246.961	52.4	-	8.0	14.2
Total	5,875.561	1,745.025	29.7	95,664	100.0	100.0
Sub-Total Residential	2,692.632	592.840	22.0	74,827	45.8	34.0
Sub-Total Non-Residential*	3,182.929	1,152.185	36.2	20,837	54.2	66.0

* Mixed use Residential/Commercial properties are included in the Non-Residential Sub-Total.

Value Estimates for Other Massachusetts Communities

For all cities and towns other than Boston we relied exclusively on State Revenue Department estimates of equalized value for Fiscal Year 1978. The assessed values in our MASSTAX data base are official local figures for FY 1978. The data that were available to us on the numbers of realty parcels are for FY 1976. Although these counts were out of date, this affected only the estimates of average tax bills and values, and does not disturb the calculation of aggregate taxes or aggregate and percentage tax changes. The Revenue Department's equalized values for realty were estimated from a survey of sales and appraisals covering the eighteen-month period ending July 1, 1977. We adopted January 1, 1977 as an effective center for this survey period and inflated all real estate values by 12.2 percent of account for one and a half years of assumed eight percent annually compounded growth to mid-1978. To be consistent with common valuation practices we did not inflate personal property values.

The likely quality of these estimates suggests that we should regard the results of our equalization simulations as illustrative and not predictive. We have already questioned the significance of official personal property valuations in discussion of Boston's tax base. While they are the best (the only!) comprehensive data available, the real property figures are also not above question. To test the "predictability" of our data, we ran a test on 32 towns that revalued their tax bases between 1976 and 1978. We compared actual 1978 tax bills with those simulated using 1976 equalization survey data. The average percentage error for single family homes was only 3.7 percent. For other types of property (excluding farm land that is protected by special

legislation) the average percentage errors ranged from 26 percent to 63 percent. It should be noted that these were all smaller towns composed mainly of single family homes. Of the 78,739 property sales used to arrive at state equalized value estimates for 1978, fully 68 percent were for single family homes. The total sample size for 1978 was significantly larger than in 1976, and we can only hope that the quality of the estimates presented in the first volume of this report exceeds that of our test "predictions" from 1976.

Regardless of the ability of our data base to forecast what is now history, we believe that it has been useful in illustrating the import of equalization and classification in Massachusetts in the days of high levys and pervasive disproportionment.

Appendix II-A

HIERARCHIC MANAGEMENT SYSTEM (HMS*) DESCRIPTION

A computer programming system which uses file descriptions built on-line to generate conversational information management computer programs which store, retrieve, update, validate, search, subset, and report on data.

These generated programs are error-free and self-documented by an on-line user's guide.

Copyright 1976 by J. Swanton, Swanton Associates, Westport, Maine.

Current HMS Implementation requires:

- IBM 360/370 computer system
- PLI programming language
- TSO (time sharing option)
- Regional (1) data sets

Data for HMS must be organized into records. Each record contains a user defined number of elements. Elements may be any of the following types:

Character	Letters and/or numbers in any order
Formatted	Letters and/or numbers in user defined positions
Number	Numbers only
Coded	Letter and/or number codes with user defined values
Structure	Grouping of any of above types
Subfile	A file of records

Default values for individual elements can be user specified. An indefinite number of records may be placed in a file, and files may contain subfiles, which contain subfiles..., and so on to any level (N-level inverted tree structure files).

Following is a list of the on-line commands:

*	RETURN/ABORT	Cancel this operation, return to previous state or file position.
?	HELP	Explain response system requires.
??	HELP-HELP	Additional explanation, usually the entire list of options is provided.
RA	READY AHEAD	Position to the next record in the file.
RB	READY BACK	Position to the previous record in the file.
RF	READY FIRST	Position to the first record in current file (or subfile).

* HMS is a trademark of Swanton Associates

RS	READY SUBFILE	Position to the first record of a subfile of the current record. If there is more than one subfile, system will ask for desired subfile name.
LE	LIST ELEMENT	Display the value of an element of the current record. System will ask for desired element name (if more than one).
LA	LIST ALL	Display the values of all the elements of the current record.
CR	COUNT RECORDS	Display the count of the number of records in the current ring.
CS	COUNT SUBFILE	Display the count of the number of records in a subfile of the current record.
EE	EXPLAIN ELEMENT	Display the description of an element, giving its type, size, default value, and format or codes, if applicable.
EA	EXPLAIN ALL	Display the descriptions of all the elements of the current record. All subfiles can also be described, if desired.
ES	EXPLAIN SUBFILE	Display the descriptions of the elements of a subfile.
USE	UPDATE ELEMENT	Display the value of an element of the current record and ask if change is desired. If yes, accept the new value, validate it, and replace existing element value.
UA	UPDATE ALL	Like UE Command except does all elements of current record.
DR	DELETE RECORD	The current record is deleted, and file position is moved to the next record. System will ask that you really want to delete -- safety feature.
DS	DELETE SUBFILE	A subfile and all its associated subfiles are deleted. Like DR Command, System will ask if you really want to delete.
BR	BUILD RECORD	A new record is to be added to the file directly before or after the current record. System will ask whether before of after. System will ask you for element values (you may specify use of defalut values by entering carriage return only). File position will be to the new record.

BS	BUILD SUBFILE	A subfile of the current record is to be added to the file. System will ask for needed element values. Default values will be provided as necessary (see BR above).
NF	NEW FIRST	The current record is to be made the first record in the file (or subfile). It will become the record pointed to by the parent record.
BM	BUILD MASK	A dummy record is to be built which will be used by the search command and the report generator. This record will be matched against the records in the file as a means of selecting a desired record or specifying a file subset.
LM	LIST MASK	The current mask is to be displayed.
SM	SEARCH MASK	Starting from the current file position, each record in the file is matched against the mask (see BM above). File position is to the first record that matches its mask. If subfile masks are specified, then a match must occur there also.
BG	BUILD GENERATOR	A report generator is to be built. System will ask for appropriate information. Number type data will be summed, averaged, and the minimum and maximum computed. Coded type data will be analyzed for sum and frequency of occurence of each code. All data types can be listed, but be careful because with large files you may be asking for thousands of values to be displayed.
LG	LIST GENERATOR	Current report generator is to be displayed.
LR	LIST REPORT	The report generator is used together with the mask to subset, list, and summarize the data in the file. Along with the elements specified in the report generator will be displayed a count of the number of records found in each file and subfile wihc match the appropriate mask. Reports can be listed on-line or off-line.
FF	FOCUS FILE	Temporarily focus attention on another file. System will ask for desired file name. While focused you may EE, EA, BM, LM, BG, LG, and FF.
RR	READY RECORD	Position to specific record in a file. System will ask for record number (each record has a unique, system-assigned number).

Appendix II-B

INTRODUCTURY USER MANUAL FOR HMS-SALES INFORMATION MANAGEMENT SYSTEM

This manual is not intended as a complete tutorial and reference document. Primary documentation is internal to SALES and can be accessed on-line at any point by typing "?" or "??" for essential or more detailed help. Instructions, definitions, code catalogs can all be found in the system when needed. This manual is an introduction to the most commonly used SALES functions:

1.	To get into the SALES file	- RF (Ready File)	Page II-B-2
2.	To find a sale record by description	- BM (Build Mask) and - SM (Search Mask)	II-B-4
3.	To find a sale when the record number is known	- RR (Ready Record)	II-B-5
4.	To correct an error	- UE (Update Element)	II-B-5
5.	To add a new sale	- BR (Build Record)	II-B-8
6.	To generate a report	- BG (Build Generator)	II-B-9
	List of SALES	Command Options	II-B-14

1. TO GET INTO THE SALES FILE

```
READY
EX SYSUSER(SALES)

CITY OF BOSTON PROPERTY SALES          79/11/13          16.10

ENTER ? FOR HELP   ?? FOR MORE HELP   AND * TO ABORT

SALES READY
ENTER COMMAND: RF
```

At this point, the command RF (Ready File) positions the Sales File to 1 YEAR READY. This 1 YEAR READY is the 1976 Sales Data.

"2 YEAR READY" = 1975 Sales data
"3 YEAR READY" = 1974 Sales data
"4 YEAR READY" = 1973 Sales data
"5 YEAR READY" = 1972 Sales data
"6 YEAR READY" = 1971 Sales data

ENTER COMMAND: RS (Ready Subfile) positions the Sales File to 45 WARD READY which is Ward 1 in 1976. The City of Boston is divided into 22 wards. Each of these wards in each year has a unique internal accounting number. The temporary numbering system is:

	WARD 1	22
1976	45	66
1975	1	22
1974	23	44
1973	111	132
1972	89	110
1971	67	88

This ward numbering system will not have to be used by the operator, but the computer will print 45 WARD READY to designate to the operator that he is in Ward (1) and year (1976) at the same time.

ENTER COMMAND: RS positions the Sales File to 7801 SALE READY which is the first sale in the 1976 Sales Data.

Each year has approximately 3,500 sales records. Similar to the above, the internal numbering system is:

YEAR	FIRST SALE NO.
1976	7801
1975	1
1974	3885
1973	19050
1972	15505
1971	12112

To remove yourself from the Sales System, hit the asterick (*) key in response to each inquiry from the system as many times as is necessary to get back to READY.

2. TO FIND A SALE

Use commands BM (Build Mask) and subsequently SM (Search Mask).

Example:

```
 4119 SALE READY
ENTER COMMAND: BM                                  Creates the mask

BUILD SALE MASK 01

ENTER SALE ELEMENT TO FIND: CLASS                  We want to find class that is
ENTER RELATION: EQ                                 equal to R2 (2 family)
ENTER CLASS: R2
ENTER SALE ELEMENT TO FIND:
ADDITIONAL MASKS NOT NEEDED?   Y/N: Y

 4119 SALE READY
ENTER COMMAND: SM                                  This command searches with the mask
                                                   to find the first 2-family sale
 4125 SALE READY                                   starting with Record #4119.
ENTER COMMAND: LA                                  The first 2-family sale found is
APNO      ASSESSORS PARCEL NUMBER        0         listed.
BP        BOOK & PAGE NUMBER
ADDRES    PARCEL ADDRESS                 1 AUBURN ST
NBOR      NEIGHBORHOOD                   CH    CHARLESTOWN
PD        PLANNING DISTRICT              17  UNKNOWN
ASVAL     TOTAL ASSESSED VALUE           2200
SQFT      PARCEL SQUARE FEET             1500
SELER     PROPERTY SELLER NAME           JOSEPH T CLUNE AL
BUYER     PROPERTY BUYER NAME            FRANCIS X CRAVEN
PRICE     TOTAL SALES PRICE              12500
AMORT     ASSUMED MORTGAGE               0
MORT      MORTGAGE                       11142
MORTE     MORTGAGEE                      O     OTHER
CLASS     PROPERTY CLASS                 R2    TWO FAMILY
DATE      DATE SALE RECORDED             74/07/17
TYPE      TYPE OF SALE                   P     PRIVATE

 4125 SALE READY
ENTER COMMAND:
```

If any additional 2-family properties are desired, then type RA (READY AHEAD) and SM (SEARCH MASK). The operator does not need to BM again, since the mask stays until a new mask is built. If we wanted to list every 2-family, we would then BG (BUILD GENERATOR) as is shown later.

3. TO LOCATE AN INDIVIDUAL SALE WHEN RECORD # IS KNOWN AND 4. TO CORRECT AN ERROR

The RR (Ready Record) command facilitates movement through the Sales System, and is especially useful in correcting an error in a sales record where the record number is already known.

For instance: examination of a proofreading list of new sales records may show several transcription errors. By including the sales record numbers in the proofreading report, we can use the Ready Record feature in conjunction with the record numbers to speed error correction.

The following examples will demonstrate that once the operator moves to the sale subfile, then using the RR command and typing the known record number, the desired record will be found.

E.g. There are errors in record numbers 4119, 10426, and 21768.

```
BY SYSUSER(SALES)

CITY OF BOSTON PROPERTY SALES          79/11/30          12.13

ENTER ? FOR HELP   ?? FOR MORE HELP   AND * TO ABORT

SALES READY
ENTER COMMAND: RF

    1 YEAR READY
ENTER COMMAND: RS

   45 WARD READY
ENTER COMMAND: RS

 7801 SALE READY
ENTER COMMAND: RR
ENTER RECORD NUMBER: 4119
```

RF (READY FILE) brings us to "1 YEAR READY" (1976). If we want to go to 1974 data, use RR command and the rec # shown in the table on page 2, or BM (BUILD MASK) and SM (SEARCH MASK).

"45 WARD READY" shows that we're in Ward 1, 1976. To get into another ward use RR command or BM and SM.

"7801 SALE READY" shows that we're at the beginning of Ward one's 1976 SALES RECORDS. Since we know the record # we want, we can go there directly with RR (READY RECORD).

```
119 SALE READY
ENTER COMMAND: LA
NO        ASSESSORS PARCEL NUMBER          0
          BOOK & PAGE NUMBER
ADRS      PARCEL ADDRESS                   9 ADAMS ST
NBR       NEIGHBORHOOD                     CH    CHARLESTOWN
          PLANNING DISTRICT                17  UNKNOWN
TVAL      TOTAL ASSESSED VALUE             6600
SQFT      PARCEL SQUARE FEET               1998
SLER      PROPERTY SELLER NAME             RUTH SKOLNIK AL TR
BYER      PROPERTY BUYER NAME              ROBT DIBONA UX
PRICE     TOTAL SALES PRICE                43000
MORT      ASSUMED MORTGAGE                 0
AMT       MORTGAGE                         33000
MRTE      MORTGAGEE                        S     SELLER
CLAS      PROPERTY CLASS                   R4    APARTMENTS (4+)
DATE      DATE SALE RECORDED               74/03/06
TYPE      TYPE OF SALE                     P     PRIVATE
```

Of course, it is not necessary to LIST ALL again since the record was listed in the original proofreading list. LIST ALL is used here for demonstration purposes.

```
119 SALE READY
ENTER COMMAND: UE
ENTER SALE ELEMENT TO UPDATE: PRICE
PRICE     TOTAL SALES PRICE                43000        OK?   Y/N: N
ENTER PRICE: 53000
```

The input sale price was $43,000 and should have been $53,000. To correct error the command UE was used. The Sale Element to update was price. The program printed $43,000 which requires a no answer. The correct price of $53,000 was entered.

Now the RR command is used to go to sale 10426. The next two corrections are done in the same manner as the previous correction.

```
119 SALE READY
ENTER COMMAND: RR
ENTER RECORD NUMBER: 10426
```

```
10426 SALE READY
ENTER COMMAND: LA
APNO      ASSESSORS PARCEL NUMBER        0
BP        BOOK & PAGE NUMBER
ADRES     PARCEL ADDRESS                 VL CLARKSON
NBOR      NEIGHBORHOOD                   U     UNKNOWN
PD        PLANNING DISTRICT              17  UNKNOWN
ASVAL     TOTAL ASSESSED VALUE           13000
SQFT      PARCEL SQUARE FEET             0
SELER     PROPERTY SELLER NAME           SEC OF HOUSING
BUYER     PROPERTY BUYER NAME            G JOHNSON
PRICE     TOTAL SALES PRICE              200
AMORT     ASSUMED MORTGAGE               0
MORT      MORTGAGE                       0
MORTE     MORTGAGEE                      U     UNKNOWN
CLASS     PROPERTY CLASS                 L     LAND
DATE      DATE SALE RECORDED             76/05/27
TYPE      TYPE OF SALE                   HP    HUD/VA - PRIVATE

10426 SALE READY
ENTER COMMAND: UE
ENTER SALE ELEMENT TO UPDATE: ASVAL
ASVAL     TOTAL ASSESSED VALUE           13000       OK?   Y/N: N
ENTER ASVAL: 1300

10426 SALE READY
ENTER COMMAND: RR
ENTER RECORD NUMBER: 21768

21768 SALE READY
ENTER COMMAND: LA
APNO      ASSESSORS PARCEL NUMBER        0
BP        BOOK & PAGE NUMBER
ADRES     PARCEL ADDRESS                 41 BROCTON ST
NBOR      NEIGHBORHOOD                   DO    DORCHESTER
PD        PLANNING DISTRICT              17  UNKNOWN
ASVAL     TOTAL ASSESSED VALUE           6000
SQFT      PARCEL SQUARE FEET             4442
SELER     PROPERTY SELLER NAME           SIEGEL,M
BUYER     PROPERTY BUYER NAME            JAMES,B
PRICE     TOTAL SALES PRICE              25500
AMORT     ASSUMED MORTGAGE               0
MORT      MORTGAGE                       22950
MORTE     MORTGAGEE                      HSB   HOME SAVINGS BANK
CLASS     PROPERTY CLASS                 R1    ONE FAMILY
DATE      DATE SALE RECORDED             73 06 06
TYPE      TYPE OF SALE                   P     PRIVATE

21768 SALE READY
ENTER COMMAND: UE
ENTER SALE ELEMENT TO UPDATE: ADRES
ADRES     PARCEL ADDRESS                 41 BROCTON ST
    OK?   Y/N: N
ENTER ADRES: 41 BROCKTON ST

21768 SALE READY
ENTER COMMAND: *

   15 WARD READY
ENTER COMMAND: *

    1 YEAR READY
```

The asterisk (*) retraces our steps first to ward subfile, then to the year file

From "1 year ready" (1976) we can proceed to other year using RR or BM and SM.

5. TO ADD A NEW SALE

ENTER COMMAND: BR (Build Record)

To build a record, position yourself in the correct year and ward, then answer all queries.

```
 4119 SALE READY
ENTER COMMAND: BR
ENTER APNO: 4124
ENTER BP:
ENTER ADRES: 24 DARTMOUTH ST
ENTER NBOR: BO
ENTER PD: 5
ENTER ASVAL: 6500
ENTER SQFT: 1429
ENTER SELER: WILLIAMS
ENTER BUYER: SMITH
ENTER PRICE: 56000
ENTER AMOPT: 0
ENTER MORT: 0
ENTER MORTE: SBSB
ENTER CLASS: R1
ENTER DATE: 79/09/10
ENTER TYPE: 9 P
INSERT AFTER?  Y/N: Y
```

This is a bookkeeping control. The standard answer is yes.

NOTE: The format for input of any new address is as follows: e.g.,
23 La Grange St
16 Somerset Terr
130 Morrisey Blvd
41 St James Ave
12 Linda Lane
Use no punctuation in addresses.

6. TO GENERATE A REPORT

ENTER COMMAND: BG (Build Generator)

In producing a report a generator and a mask must be built. The generator creates the report and the mask extracts the desired information. The following entitled "1976 Sales of One Family (R1) Properties in the City of Boston in Ward 2" will show how to create a report when given a set of Sales elements.

```
LOGON BRA004 SIZE(750).
IKJ56470I BRA004 LOGGED OFF TSO AT 13:57:56 ON NOVEMBER 2, 1979
IKJ56455I BRA004 LOGON IN PROGRESS AT 13:57:57 ON NOVEMBER 2, 1979
***** CITY OF BOSTON TIME SHARING ****
READY
EX SYSUSER(SALES)

CITY OF BOSTON PROPERTY SALES          79/11/02          13.58

ENTER ? FOR HELP   ?? FOR MORE HELP   AND * TO ABORT

SALES READY
ENTER COMMAND: RF

    1 YEAR READY
ENTER COMMAND: RS

   45 WARD READY
ENTER COMMAND: RR
ENTER RECORD NUMBER: 46                 Moves us from Ward 1, 1976 to Ward 2, 197

   46 WARD READY
ENTER COMMAND: RS

 8076 SALE READY
ENTER COMMAND: BM

BUILD SALE MASK 01

ENTER SALE ELEMENT TO FIND: CLASS       The class is equal to R1.  We want 1-fami
ENTER RELATION: EQ                      homes.
ENTER CLASS: R1
ENTER SALE ELEMENT TO FIND:
ADDITIONAL MASKS NOT NEEDED?   Y/N:     We don't need additional masks.  We want
                                        1-family homes.
                                        If we want to be more selective, we could
                                        specify further sales elements to find.
```

```
076 SALE READY
TER COMMAND: BG
ILDING REPORT GENERATOR FOR SALE
TER TITLE: 1976 ONE FAMILY SALE TRANSACTIONS FOR CHARLESTOWN
TER LITERAL: ' !'
TER SALE ELEMENT TO LIST: R#
TER LITERAL: ' !ADDRESS: '
TER SALE ELEMENT TO LIST: ADRES
TER LITERAL: ' !CLASS: '
TER SALE ELEMENT TO LIST: CLASS
TER LITERAL: ' !PRICE: '
TER SALE ELEMENT TO LIST: PRICE
TER LITERAL: ' !ASSESSED VALUE: '
TER SALE ELEMENT TO LIST: ASVAL
TER LITERAL: ' !SELLER: '
TER SALE ELEMENT TO LIST: SELER
TER LITERAL: ' !BUYER: '
TER SALE ELEMENT TO LIST: BUYER
TER LITERAL: ' !TYPE OF SALE: '
TER SALE ELEMENT TO LIST: TYPE
TER LITERAL: ' !DATE OF SALE: '
TER SALE ELEMENT TO LIST: DATE
TER LITERAL:
TER SALE ELEMENT TO LIST:
TER SALE ELEMENT TO SUM:

76 SALE READY
ER COMMAND: LR
TERMINAL?   Y/N: Y
```

BG-builds generator

A "Literal" is a label. We enclose them in quotation marks. The exclamation point tells the system to skip a line before printing.

A "Sale Element" is an individual datum for a recorded sale. They must be typed correctly.

LR=list the report.
Because this report is short we list it immediately on our terminal rather than on a high speed printer in the computer room.

```
Y OF BOSTON PROPERTY SALES          79/11/02          14.06

6 ONE FAMILY SALE TRANSACTIONS FOR CHARLESTOWN



81
RESS: 2 AVON PL
SS: ONE FAMILY
CE:          12000
ESSED VALUE:           1000
LER: GRANDALL
ER: POLLAK
E OF SALE: PRIVATE
E OF SALE: 76/00/20

82
RESS: 8 AVON PLACE
SS: ONE FAMILY
CE:            600
ESSED VALUE:            600
LER: HORNER, WILLIAM
ER: MORRIS, MARIAM F.
E OF SALE: PRIVATE - PRICE PROBLEM
E OF SALE: 00/00/00
```

Here's the beginning of our report.

The preceeding page was generated from the sale subfile. If one family sales from all wards in the City of Boston were desired, a generator and a mask would have to be built in the Ward subfile and linked to the Sale subfile.

e.g.

```
    1 YEAR READY
ENTER COMMAND: RS

   45 WARD READY
ENTER COMMAND: BM                    "The mask is built in ward subfile so we can look
                                      into each ward.
BUILD WARD MASK 01                    We do not enter "Ward element to find" because we
                                      want all wards, not just one or some
ENTER WARD ELEMENT TO FIND:
ADDITIONAL MASKS NOT NEEDED?   Y/N: N          Additional masks are needed,
BUILD MASK 02 AND -AND- TO MASK 01?   Y/N: N   but not to look for wards
BUILD MASK 02 AND -OR- TO MASK 01?    Y/N: N   rather to look into the sale subf
BUILD SUBFILE MASKS FOR WARD?   Y/N: Y         ward subfile is linked to sale su
ENTER WARD SUBFILE TO MASK: SALE
ENTER WARD SUBFILE TO MASK:

   45 WARD READY
ENTER COMMAND: BG                    Generator is built in ward subfile.
BUILDING REPORT GENERATOR FOR WARD
ENTER TITLE: 1976 ONE FAMILY SALE TRANSACTIONS FOR THE CITY OF BOSTON BY WA
ENTER LITERAL:
ENTER WARD ELEMENT TO LIST: WARD     We want the ward printed on the rep
ENTER LITERAL:
ENTER WARD ELEMENT TO LIST:
ENTER WARD ELEMENT TO SUM:
ENTER WARD SUBFILE TO REPORT: SALE   Ward subfile is linked to sale subf

   45 WARD READY
ENTER COMMAND: RS

 7801 SALE READY                     Mask is built in sale subfile.
ENTER COMMAND: BM

BUILD SALE MASK 01

ENTER SALE ELEMENT TO FIND: CLASS    Class is equal to 1-family homes.
ENTER RELATION: EQ
ENTER CLASS: R1
ENTER SALE ELEMENT TO FIND:
ADDITIONAL MASKS NOT NEEDED?   Y/N:
```

```
301 SALE READY
TER COMMAND: BG
ILDING REPORT GENERATOR FOR SALE
TER TITLE:
TER LITERAL: ' !'
TER SALE ELEMENT TO LIST: R#
TER LITERAL: ' !ADDRESS: '
TER SALE ELEMENT TO LIST: ADRES
'ER LITERAL: ' !CLASS: '
'ER SALE ELEMENT TO LIST: CLASS
'ER LITERAL: ' !SALES PRICE: '
'ER SALE ELEMENT TO LIST: PRICE
'ER LITERAL: ' !ASSESSED VALUE: '
'ER SALE ELEMENT TO LIST: ASVAL
'ER LITERAL: ' !SELLER: '
'ER SALE ELEMENT TO LIST: SELER
'ER LITERAL: ' !BUYER: '
'ER SALE ELEMENT TO LIST: BUYER
'ER LITERAL: ' !TYPE OF SALE: '
'ER SALE ELEMENT TO LIST: TYPE
ER LITERAL: ' !DATE OF SALE: '
ER SALE ELEMENT TO LIST: DATE
ER LITERAL:
ER SALE ELEMENT TO LIST:
ER SALE ELEMENT TO SUM:

01 SALE READY
ER COMMAND: *
```

Operator must return to ward subfile to list the report.

```
45 WARD READY
ER COMMAND: LR
TERMINAL?   Y/N: Y
```

e is the beginning of the generated report.

```
Y OF BOSTON PROPERTY SALES          79/11/02          15.08

6 ONE FAMILY SALE TRANSACTIONS FOR THE CITY OF BOSTON BY WARD


D 1

05
RESS: 30 ANNAVOY ST.
SS: ONE FAMILY
ES PRICE:          20000
ESSED VALUE:            5500
LER: VELARDO, J. ETAL
ER: VELARDO, S.
E OF SALE: FAMILY SALE
E OF SALE: 76/09/08
```

```
 7810
ADDRESS: 35 ASHLEY ST.
CLASS: ONE FAMILY
SALES PRICE:          10500
ASSESSED VALUE:            2600
SELLER: FORREY,V.
BUYER: DEBAY, J. ETAL
TYPE OF SALE: PRIVATE
DATE OF SALE: 76/02/00

 7811
ADDRESS: 52 ASHLEY ST.
CLASS: ONE FAMILY
SALES PRICE:          39000
ASSESSED VALUE:            5000
SELLER: ROMAN CATH. ARCHBI
BUYER: MARSEGLIA, M. ETAL
TYPE OF SALE: PRIVATE
DATE OF SALE: 76/17/11
```

If at any time during the use of the Sale System assistance is needed the operator should type ? or ?? for options or choices for the next steps to be taken.

SALES FILE COMMAND POSSIBILITIES

MMAND POSSIBILITIES

RF	READY FILE	POSITION TO FIRST RECORD OF FILE
CF	COUNT FILE	DISPLAY NUMBER OF RECORDS IN FILE
EF	EXPLAIN FILE	DISPLAY FILE DESCRIPTION
FF	FOCUS FILE	FOCUS ATTENTION ON A SPECIFIC FILE
TL	TERM LINESIZE	SET LINE LENGTH OF THIS TERMINAL
BF	BUILD FILE	CREATE FILE RECORD - MUST BE EMPTY
DF	DELETE FILE	REMOVE ALL FILE DATA - MAKE EMPTY

SUBFILE YEAR COMMAND POSSIBILITIES

IMAND POSSIBILITIES

RA	READY AHEAD	POSITION TO NEXT RECORD IN RING
RB	READY BACK	POSITION TO PREVIOUS RECORD IN RING
RF	READY FIRST	POSITION TO FIRST RECORD IN RING
RS	READY SUBFILE	POSITION TO FIRST RECORD OF SUBFILE
LE	LIST ELEMENT	DISPLAY ELEMENT VALUE
LA	LIST ALL	DISPLAY ALL ELEMENT VALUES OF CURRENT RECORD
CR	COUNT RECORDS	DISPLAY NUMBER OF RECORDS IN RING
CS	COUNT SUBFILE	DISPLAY NUMBER OF RECORDS IN SUBFILE
EE	EXPLAIN ELEMENT	DISPLAY ELEMENT DESCRIPTION
EA	EXPLAIN ALL	DISPLAY ALL ELEMENT DESCRIPTIONS
ES	EXPLAIN SUBFILE	DISPLAY SUBFILE DESCRIPTION
UE	UPDATE ELEMENT	REPLACE ELEMENT VALUE
UA	UPDATE ALL	REPLACE ALL ELEMENT VALUES IN CURRENT RECORD
BR	BUILD RECORD	ADD NEW RECORD AFTER/BEFORE CURRENT RECORD
BS	BUILD SUBFILE	CREATE SUBFILE RECORD - MUST BE EMPTY
DR	DELETE RECORD	REMOVE CURRENT RECORD AND POSITION TO NEXT
DS	DELETE SUBFILE	REMOVE ALL SUBFILE DATA - MAKE EMPTY
NF	NEW FIRST	MAKE CURRENT RECORD FIRST ONE IN RING
BM	BUILD MASK	CREATE SEARCH MASK
LM	LIST MASK	DISPLAY SEARCH MASK
SM	SEARCH MASK	POSITION TO NEXT RECORD THAT MATCHES MASK
BG	BUILD GENERATOR	CREATE REPORT GENERATOR
LG	LIST GENERATOR	DISPLAY REPORT GENERATOR
LR	LIST REPORT	USE MASK AND GENERATOR TO PRODUCE REPORT
FF	FOCUS FILE	TEMPORARILY FOCUS ATTENTION ON ANOTHER FILE
RR	READY RECORD	POSITION TO SPECIFIC RECORD

SUBFILE WARD COMMAND POSSIBILITIES

COMMAND POSSIBILITIES

EE	EXPLAIN ELEMENT	DISPLAY ELEMENT DESCRIPTION
EA	EXPLAIN ALL	DISPLAY ALL ELEMENT DESCRIPTIONS
BM	BUILD MASK	CREATE SEARCH MASK
LM	LIST MASK	DISPLAY SEARCH MASK
BG	BUILD GENERATOR	CREATE REPORT GENERATOR
LG	LIST GENERATOR	DISPLAY REPORT GENERATOR
FF	FOCUS FILE	TEMPORARILY FOCUS ATTENTION ON ANOTHER FILE

SUBFILE SALE COMMAND POSSIBILITIES

COMMAND POSSIBILITIES

EE	EXPLAIN ELEMENT	DISPLAY ELEMENT DESCRIPTION
EA	EXPLAIN ALL	DISPLAY ALL ELEMENT DESCRIPTIONS
BM	BUILD MASK	CREATE SEARCH MASK
LM	LIST MASK	DISPLAY SEARCH MASK
BG	BUILD GENERATOR	CREATE REPORT GENERATOR
LG	LIST GENERATOR	DISPLAY REPORT GENERATOR
FF	FOCUS FILE	TEMPORARILY FOCUS ATTENTION ON ANOTHER FILE

Appendix II-C

Boston Real Estate Transactions
1975

BOSTON REAL ESTATE TURNOVER 1975
PERCENT OF STOCK AND (NUMBER SOLD)

(Rev. 9/8/77)

Wd		(1) 1-Family		(2) 2-Family		(3) 3-Family		(4) Apartments		(5) Land		(6) Mixed Use		(7) Mercantile		(8) Industrial		(9) Condominiums		(10) Other	(11) Total
1	East Boston*	4.3	(40)	4.4	(59)	4.6	(101)	6.6	(16)	2.6	(18)	.5	(2)	10.3	(50)		(0)		(0)	(1)	(287)
2	Charlestown*	4.1	(36)	5.4	(29)	7.6	(38)	2.0	(2)	4.5	(16)	1.1	(1)	20.7	(12)	5.1	(4)		(0)	(2)	(140)
3	Downtown Neighborhoods*	15.8	(15)	1.6	(1)	5.1	(11)	4.2	(32)	.9	(3)	2.0	(11)	7.2	(60)	6.3	(6)	16.9	(53)	(1)	(193)
4	Fenway-South End*	9.9	(30)	20.7	(12)	1.7	(3)	8.3	(75)	.8	(1)	1.9	(3)	15.3	(19)		(0)	18.2	(6)	(4)	(153)
5	Back Bay-Beacon Hill	8.4	(44)	9.3	(7)	5.7	(8)	6.3	(111)	1.7	(2)	1.4	(4)	8.8	(49)		(0)	28.4	(326)	(25)	(576)
6	City Point-So. Boston*	5.0	(48)	4.0	(31)	6.9	(50)	.9	(8)	8.7	(66)	.6	(1)	7.1	(27)	.7	(2)		(0)	(1)	(234)
7	Andrew Square-So. Bos.*	2.1	(15)	4.9	(37)	6.5	(85)	7.7	(5)	4.2	(18)	2.7	(4)	12.5	(11)	3.1	(6)		(0)	(0)	(101)
8	Roxbury-City Hospital	7.5	(15)	8.1	(18)	5.8	(23)	5.7	(13)	1.9	(10)	8.3	(2)	4.8	(9)	5.0	(6)		(0)	(2)	(98)
9	Roxbury-Madison Park*	18.0	(22)	12.0	(11)	9.6	(17)	6.0	(25)	7.7	(11)	3.1	(4)	18.1	(20)	40.0	(2)		(0)	(1)	(113)
10	Parker Hill*	6.1	(15)	5.8	(19)	10.5	(80)	16.8	(26)	2.3	(7)	3.2	(3)	9.8	(8)		(0)		(0)	(0)	(158)
11	Roxbury-Egelston Sq.	6.2	(30)	4.8	(27)	6.8	(65)	7.3	(17)	6.7	(28)	1.5	(1)	11.7	(24)	3.8	(1)	27.2	(33)	(0)	(225)
12	Washington Park-Warren*	5.7	(24)	5.7	(31)	4.0	(26)	7.6	(24)	6.4	(11)		(0)	11.7	(13)		(0)		(0)	(3)	(132)
13	Savin Hill-Columbia*	6.8	(46)	3.7	(21)	5.7	(63)	14.8	(17)	6.0	(19)		(0)	6.9	(10)	8.3	(1)		(0)	(0)	(177)
14	Franklin Field*	6.2	(36)	6.5	(84)	9.8	(169)	5.5	(22)	5.5	(23)		(0)	13.7	(38)		(0)		(0)	(1)	(373)
15	Ronan Park*	7.1	(38)	8.5	(53)	8.6	(110)	4.6	(5)	4.9	(12)		(0)	5.0	(9)		(0)		(0)	(0)	(227)
16	Dorchester-Neponset*	3.7	(68)	4.6	(67)	3.6	(35)	10.2	(13)	1.7	(7)		(0)	2.4	(8)		(0)		(0)	(1)	(199)
17	Codman & Pierce Squares	6.6	(114)	8.8	(126)	11.5	(115)	10.9	(20)	6.3	(20)		(0)	12.9	(29)	10.0	(1)		(0)	(1)	(426)
18	Hyde Park*	4.3	(299)	2.1	(145)	4.6	(28)	5.4	(13)	2.0	(38)		(0)	5.0	(26)	2.3	(1)		(0)	(26)	(576)
19	Jamaica Plain	4.0	(80)	3.7	(47)	5.5	(38)	3.6	(7)	2.7	(12)		(0)	3.2	(7)		(0)		(0)	(2)	(193)
20	West Roxbury*	4.2	(319)	3.8	(72)	4.0	(14)	2.0	(2)	2.2	(39)		(0)	3.3	(12)		(0)	5.8	(4)	(1)	(463)
21	Brighton-Comm. Ave.	5.8	(26)	5.6	(33)	7.4	(19)	4.9	(40)	5.4	(8)		(0)	4.6	(12)		(0)		(0)	(0)	(138)
22	Brighton-Allston	4.1	(56)	3.1	(65)	5.0	(26)	5.6	(14)	4.2	(20)		(0)	3.8	(11)	3.6	(4)		(0)	(2)	(198)
	TOTAL		1,416		995		1,124		507		389		36		463		34		422	74	5,460
	% OF TOTAL	4.8		5.1		6.7		6.6		3.6		1.4		7.7		3.4		21.1			

* For those wards marked with an asterisk, information on the type of property sold was not available for the last one or two months of 1975. In such cases, the total number of properties conveyed during these months was recorded from Banker and Tradesman and was attributed to property types according to the proportions observed for the first ten months.

1975

REAL ESTATE SALES SUMMARY SHEET

(Rev. 9/8/77

Wd		(1) Sales Transactions	(2) Properties Sold	(3) Residential Prop. Sold (% Sales)	(4) Months Covered Since 1/1/75	(5) Banks	(6) HUD	(7) City	(8) DRA	(9) Col. 5-8 Total	(10) Props Involved Cols 5-8	(11) Number (%) Family Conveyances	(12) Non-Family Sales-$2000 Or Less
						Number of Properties Bought (Sold) by							
1	East Boston	187	208	157	10	4	0	0	0	4	13	17	6
				(75.5)		(1)	(0)	(8)	(1)	(10)	(6.2)	(8.2)	(2.9)
2	Charlestown	94	102	76	10	0	0	0	0	0	7	9	3
				(74.5)		(0)	(0)	(2)	(5)	(7)	(6.9)	(8.8)	(2.9)
3	Downtown Neighborhoods	154	166	97	11	2	0	0	2	4	14	8	7
				(58.4)		(2)	(0)	(2)	(8)	(12)	(8.4)	(4.8)	(4.2)
4	Fenway-South End	127	131	108	10	14	0	0	1	15	25	7	2
				(82.4)		(5)	(0)	(3)	(3)	(11)	(18.9)	(5.3)	(1.5)
5	Back Bay-Beacon Hill	520	576	496	12	6	0	1	0	7	21	15	2
				(86.1)		(14)	(0)	(0)	(0)	(14)	(3.6)	(2.6)	(.3)
6	City Point-South Boston	166	182	106	10	6	0	0	0	6	35	6	13
				(58.2)		(6)	(0)	(24)	(0)	(30)	(19.2)	(3.3)	(7.1)
7	Andrew Square-South Boston	135	142	111	10	8	2	0	0	10	30	5	6
				(78.2)		(3)	(1)	(16)	(0)	(20)	(21.1)	(3.5)	(4.2)
8	Roxbury-City Hospital	84	98	68	12	0	0	0	0	0	14	2	13
				(69.4)		(2)	(5)	(7)	(0)	(14)	(14.3)	(2.0)	(13.3)
9	Roxbury-Madison Park	79	92	61	10	2	0	0	9	11	26	1	22
				(66.3)		(1)	(2)	(13)	(4)	(20)	(28.3)	(1.1)	(23.9)
10	Parker Hill	95	115	102	10	8	1	0	0	9	26	1	9
				(88.7)		(12)	(3)	(3)	(0)	(18)	(22.6)	(.9)	(7.8)
11	Roxbury-Egleston Square	194	225	171	12	3	10	0	0	13	44	16	19
				(76.0)		(6)	(5)	(25)	(0)	(36)	(19.5)	(7.1)	(8.4)
12	Washington Park-Warren	91	95	76	10	5	11	5	1	22	42	3	16
				(80.0)		(11)	(3)	(23)	(0)	(37)	(44.2)	(3.2)	(16.3)
13	Savin Hill-Columbia	124	138	114	10	2	5	2	0	9	32	5	21
				(82.6)		(2)	(7)	(14)	(0)	(23)	(23.2)	(3.6)	(15.2)
14	Franklin Field	275	297	248	10	30	48	0	0	78	173	12	81
				(83.5)		(31)	(75)	(22)	(0)	(128)	(58.2)	(4.0)	(26.8)
15	Ronan Park	176	184	167	10	10	17	0	0	27	55	3	24
				(90.8)		(14)	(15)	(10)	(0)	(39)	(30.2)	(1.6)	(13.2)
16	Dorchester-Neponset	144	149	137	10	7	0	0	0	7	10	7	2
				(91.9)		(4)	(0)	(3)	(0)	(7)	(6.7)	(4.7)	(1.3)
17	Codman & Pierce Squares	407	426	375	12	16	31	6	0	53	95	24	43
				(88.0)		(17)	(36)	(2)	(0)	(55)	(22.2)	(5.6)	(10.0)
18	Hyde Park	422	445	375	10	11	4	0	0	15	20	23	4
				(84.3)		(5)	(3)	(1)	(0)	(9)	(4.5)	(5.2)	(.9)
19	Jamaica Plain	187	193	172	12	1	3	2	0	6	11	8	2
				(89.1)		(0)	(3)	(2)	(0)	(5)	(5.7)	(4.1)	(1.0)
20	West Roxbury	326	359	319	10	1	0	0	0	1	7	37	1
				(88.9)		(5)	(0)	(1)	(0)	(6)	(1.9)	(10.3)	(.3)
21	Brighton-Commonwealth Ave.	112	138	118	12	0	0	0	0	0	10	8	0
				(85.5)		(10)	(0)	(0)	(0)	(10)	(7.2)	(5.8)	(0)
22	Allston-Brighton	185	198	161	12	1	0	0	0	1	9	12	2
				(81.1)		(6)	(0)	(2)	(0)	(8)	(4.5)	(6.1)	(1.0)
	GRAND TOTAL	4,292	4,659	3,815		137	132	16	13	298	719	229	298
				(81.9)		(157)	(150)	(183)	(21)	(519)	(15.4)	(4.9)	(6.4)

Appendix II-D

Working Notes for the
Tax Policy Study Group

John Avault
July 11, 1978

TRANSLATING MEASURES OF COMMERCIAL PROPERTY TAX EFFORT: PERCENT OF INCOME, ASSESSMENT/VALUE RATIO, EFFECTIVE TAX RATE, TAX PER FOOT

Different, but related, standards are used to measure commercial property tax effort. As we try to deal with issues of comparability and equalization, we need techniques that allow us to express measures under one standard in terms of other standards. A set of such techniques is presented below. After the definition of shorthand symbols to represent the quantities that are involved, a set of cook book formulae are listed, followed by a few general comments and a set of conversion tables illustrating applications. Finally, algebraic derivation are outlined.

Symbols and Definitions

A = Assessed Value
(This is effective assessment, adjusted for abatements)

V = Economic Value
(This estimate of market value is based on income capitalization)

T = Property Tax Bill

I = Effective Gross Income
(Gross Rent adjusted for vacancies)

O = Operating Expenses
(Not including fixed charges or debt service)

The above upper case symbols may be understood either as totals or per square foot figures, provided we do not mix the two viewpoints in the same formula.

e = effective tax rate
(Taxes as a percent of market or economic value - expressed in decimal form. e = T/V)

n = nominal tax rate
(Expressed in decimal form - e.g.: $252.90/$1,000 assessment = .2529)

c = capitalization rate
(Accepted rate of return on economic value)

p = property taxes as a percent of effective gross income
(T/I expressed in decimal form)

o = operating expenses as a percent of effective gross income
(O/I expressed in decimal form)

Value is here derived from capitalization of income. The capitalization rate is the accepted ratio of net operating income (gross rents net of operating costs and property taxes but not debt service) to economic value. Value is therefore derived as net operating income divided by the "cap" rate.

A) $V = \frac{I-O-T}{c} = \frac{I-O}{c+e}$

Economic value estimated by income capitalization is a very useful concept, especially when we are dealing with averages of several properties or averages for one property over a period of time. However, income properties often sell for prices significantly different from (frequently higher than) their value as determined by capitalization. Conversion opportunities,

capital gain anticipation, personal finances, and changing market perceptions and expectations are among the hard to quantify factors that influence market decisions. We must also remember that capitalization should be applied to the expected future stream of income and expenses, which may be different from present flows.

The formulae involving "taxes per square foot" can also be applied to taxes per room or dwelling unit in some cases if we take care to express other quantities in these terms too.

Formulae

Converting from Taxes as a Percent of Effective Gross Income (p):

1) $A/V = \frac{pc}{n\ (1-o-p)}$

2) $e = \frac{pc}{(1-o-p)}$

3) $T = pI$

Converting from Assessment/Value Ratios (A/V):

4) $p = \frac{(A/V)\ (n/c)\ (1-o)}{(1\ +\ (A/V)\ (n/c))}$

5) $e = (A/V)n$

6) $T = (A/V)\ \frac{(I-O)n}{c\ +\ (A/V)n} = (A/V)\ \frac{(1-o)In}{c\ +\ (A/V)n}$

Converting from Effective Tax Rate (e):

7) $p = \frac{e(1-o)}{(c+e)}$

8) $A/V = e/n$

9) $T = \frac{e(I-O)}{(c+e)} = \frac{eI(1-o)}{(c+e)}$

Converting from Tax per Square Foot (T):

10) $p = T/I$

11) $A/V = \frac{T(c/n)}{(1-o)I-T}$

12) $e = cT/(I-O-T)$

Illustrative Tables

In order to apply these formulae we must know the values of the relevant economic parameters. The tables below all reflect a nominal tax rate of $252.90 per $1,000 of assessment (n = .2529). Cap rates, operating expense ratios, and income per foot are specified for each individual table. These last three parameters can assume wide ranges of values in many

combinations. The combinations of values used for the tables are not unrealistic (for instance: higher cap rates and expense ratios are often associated, along with lower income), but for "real world" work direct use of the formulae will prove more flexible and useful.

TABLE I

Assumes a 10.5 percent cap rate (c=.105) and a 25 percent ratio of operating expenses to income (o=.25). An effective gross income of $10. per square foot (I=$10) is assumed for "tax per foot" calculations.

Assessment to Value Ratio A/V	Taxes as % Of Income p	Effective Tax Rate e	Taxes Per Foot T
.20	.244	.05058	$2.44
.30	.315	.07587	3.15
.40	.368	.10116	3.68
.50	.410	.12645	4.10
.60	.443	.15174	4.43
.70	.471	.17703	4.71
.80	.494	.20232	4.94
.90	.513	.22761	5.13
1.00	.530	.25290	5.30

TABLE II

Assumes a 10.5 percent cap rate (c=.105) as did Table I. Again an effective gross income of $10 per foot (I=$10.) is specified for "tax per foot" examples. However, a 35 percent ratio of operating expenses to income (o=.35) is used here.

Assessment to Value Ratio A/V	Taxes as % Of Income p	Effective Tax Rate e	Taxes Per Foot T
.20	.211	.05058	$2.11
.30	.273	.07587	2.73
.40	.319	.10116	3.19
.50	.355	.12645	3.55
.60	.384	.15174	3.84
.70	.408	.17703	4.08
.80	.428	.20232	4.28
.90	.445	.22761	4.45
1.00	.459	.25290	4.59

TABLE III

Is based on an 11.5 percent cap rate (c=.115) and a 40 percent operating expense ratio (o=.40). "Tax per foot" figures assume $7.50 per foot income.

Assessment to Value Ratio A/V	Taxes as % Of Income p	Effective Tax Rate e	Taxes Per Foot T
.20	.183	.05058	$1.37
.30	.238	.07587	1.79
.40	.281	.10116	2.11
.50	.314	.12645	2.36
.60	.341	.15174	2.56
.70	.364	.17703	2.73
.80	.383	.20232	2.87
.90	.399	.22761	2.99
1.00	.412	.25290	3.09

TABLE IV

Pertains to a 12.5 percent cap rate (c=.125) and a 50 percent operating expense ratio (o=.50). "Tax per foot" figures assume $5 per foot income.

Assessment to Value Ratio A/V	Taxes as % Of Income p	Effective Tax Rate e	Taxes Per Foot T
.20	.144	.05058	$0.72
.30	.189	.07587	.94
.40	.224	.10116	1.12
.50	.251	.12645	1.26
.60	.274	.15174	1.37
.70	.293	.17703	1.47
.80	.309	.20232	1.55
.90	.323	.22761	1.61
1.00	.335	.25290	1.67

In all of the preceding tables, the effective tax rate associated with a given assessment/value ratio is always the same. Furthermore, these two measures are always proportional and they therefore change at the same rate. Of course, this is because the effective tax rate is derived by multiplying the assessment/value ratio by the nominal tax rate (here a constant).

Similarly, taxes as a percent of income and taxes per foot are always proportional within a given table and they change at the same rate. After all, the tax per foot is derived by multiplying income per foot by taxes expressed as a proportion of income.

The dynamic relationship between the assessment/value ratio (or effective tax rate) and tax as a percent of income is worthy of note. As the assessment/value ratio increases at an even, steady rate, tax as a percent of income increases at an ever slower rate. This happens because increasing taxes imply not only higher assessments, but also lower value due to decreasing profitability. Turning back to Table I, we see that as "A/V" doubles from .20 to .40, the tax measure "p" increases by 51 percent from .244 to .368. As "A/V" doubles again from .40 to .80, "p" increases by only 34 percent from .368 to .494. If "p" were to approach .75 in Table I, "A/V" would approach

infinity since profits and therefore value would draw close to zero.

It is also clear that for a given "A/V", we will have a lower "p" where the operating expense ratio (o) or the cap rate (c) is higher. This again is a consequence of the income capitalization approach to value which ties value to profits and a required rate of return.

Chapter III

PROPERTY VALUE DYNAMICS: THE EFFECTS OF TIME AND TAXES

	Page
General Introduction	III-1
An Introduction to the Residential Value Index	2
The Index Problem and A Non-Hedonic Solution	6
Updating the Residential Value Index	13
Assumptions and Interpretations; Sample Selection and Weights	16
Testing for Differences Among Property Types Within A Neighborhood	19
The Boston City Residential Value Index	23
Data Sources	25
Procedures and Programs for Computing the RVI	26
An Introduction to Tax Capitalization	30
A Simple Model of Tax Capitalization	43
Iterative Adjustment to Equilibrium	44
The Steady State Path to Equilibrium	48
An Alternative Derivation	50
Equilibrium Value Tax Base	51
Expanding the Notation for Classification	53
Expanding the Model for Reality	55
Appendix III-A Planning District and Boston City Residential Value Index with Supporting Tables	
Appendix III-B Preliminary Estimates of the 1979 RVI: An Update for Boston and Wards by Chained Link Relatives	
Appendix III-C A Catalog of Computer Resources for the RVI and Program Lists	

III. MEASURING TIME TRENDS IN PROPERTY VALUE, AND PROJECTING HOW VALUES WOULD CHANGE WITH REVALUATION AND CLASSIFICATION

The property value estimates described in the previous chapter are meaningful only in reference to a particular set of conditions and period of time. Property values change over time and they cannot be expected to stand still during the time we require to collect, organize, and analyze the data. Our value estimates are out of date by the time they are complete. This creates a general problem in property tax administration to the extent that value changes and infrequent revaluation can result in inappropriate assessments. Where different properties change in value at non-uniform rates, disproportionment can evolve from formerly equalized assessments. The Index of residential property market value trends summarizes past sales price and assessment changes by neighborhood, pointing out the extent of the problem and offering help toward a solution. The Index was used to update some of the value estimates employed in this study.

Another variety of property value change that concerns us especially is the possible future response of market values to large tax changes. The effect of property taxes on values is called tax capitalization. If new assessed values accurately based on current market values cause large tax changes that in turn cause significant market value changes, then the assessments will have caused their own obsolescence and we will have missed the mark. Our simulations of property tax equalization were generally performed under each of two complementary hypotheses: that no tax capitalization will occur or alternatively that all tax burden shifts are capitalized into value changes in a very straightforward manner.

While the factors influencing property values and therefore the property tax base are numerous, we have explicitly contended with only these two:

time and taxes. The empirically constructed value trend Index is actually a blanket thrown over the composite of past price changes for neighborhood residential properties. The shape of the blanket's surface shows the combined effects of many different market forces that have been at work in the local study areas.

Insofar as some of these forces are of longer term duration, we can infer that the near future will somewhat reflect the past. We have no empirical guidelines for the magnitude, structural form, or even the existence of tax capitalization in Boston's future. We believe, however, that some tax capitalization is likely to occur. Our modeling of these tax/value effects is intended to illustrate the logical implications of a simple set of theoretical assumptions. Our purpose is to indicate the general magnitude and direction of capitalization and facilitate further discussion.

The following sections on the value trend Index and tax capitalization begin with a general description for the non-specialist. The introductions are followed by more technical considerations of the topics and details of methods.

An Introduction to the Index

The significance of the Residential Value Index (RVI) is somewhat analagous to the familiar Consumer Price Index (CPI) used to measure inflation--the changing price of a representative "basket" of consumer goods. Such an index starts in (or is normalized to) a base year with a value of one (1.000) or one hundred (100. which can be thought of as 100 percent or one). The index values for subsequent years show the prices in those years compared to the price in the base year. Such an index does not show actual prices but rather

the proportion by which prices have changed. For an example, consider the Boston City RVI:

Year	Sales	Assess.	
1955	1.000	1.000	. . . . .1955 is our base year. Both sales price and assessment indices are set to 1.0
1956	1.048	1.004	
1957	1.059	1.014	
1958	1.103	1.031	. . . . .By 1958, the average sales price for a typical residential unit had increased by 10.3%. What $1.00 bought in 1955 costs about $1.10 in 1958
1959	1.203	1.000	
1960	1.188	1.004	
1961	1.248	1.021	
1962	1.261	1.006	
1963	1.365	1.013	
1964	1.430	1.026	. . . . .In 1964 you could, on average, sell for $1.43 dollar's worth of residential real estate you bought in 1955. While property values had increased by 43%, assessments rose only 2.6%.
1965	1.567	1.030	
1966	1.558	1.028	
1967	1.650	1.018	
1968	1.704	1.039	
1969	1.819	1.041	
1970	2.024	1.037	
1971	2.025	1.069	. . . . .By 1971 sales prices for residential property throughout Boston had more than doubled from t 1955 base level.
1972	2.280	1.063	
1973	2.468	1.085	. . . . .Between 1973 and 1975, average market values r
1974	2.495	1.120	by less than 1% (2.487/2.468 = 1.008) and asse
1975	2.487	1.140	ments increased 5% (1.140/1.085 = 1.051). But even so, 1975 assessments were only 14% above their 1955 level and prices 148.7% higher than in the base year.

A useful description of what the RVI measures is: the average rate of change in sales price (or assessed value in the case of the assessment Index) shown by a sample of typical residential properties that have not experienced special structural change. The Index was calculated for individual neighborhoods and the Boston City Index then figured as the average of all neighborhoods, with each neighborhood weighted according to its proportion of City dwelling units. The City Index can be thought of as showing the price or assessment experience of a typical Boston housing unit. A less concise, but more accurate description of the Index's meaning is the set of rules used t select and analyze the data sample.

Each neighborhood Index was prepared by averaging the price changes shown by individual properties that were sold twice during the study period. Properties that changed in use description or number of units between sales were excluded. The "sales pair" approach helps protect the Index from being influenced by year to year variations in the size or quality of properties sold. An Index focuses on price changes over time for the same commodity and its computation must normally take into account differences in size and quality among the individual goods it averages together. This could be an insurmountable task when dealing with a market as complex and with as many difficult to quantify differences as residential real estate. The only time you can be sure that the basic characteristics of two properties are nearly the same, is if the two properties are, in fact, the same parcel and structure viewed at two different points in time. Even though we have excluded properties that obviously underwent major conversion, we can be sure that there were some changes occurring between sales due to differing levels of maintenance or deterioration. This is why we say that the Residential Value Index refers to the "typical" property.

The Residential Value Index cannot tell the entire story of evolving neighborhood values. Although the total value of the housing stock changes with new construction, conversions, and demolitions, the Index does not cover these activities. In some parts of the City abandonment and demolition on the one hand, or conversion and major upgrading on the other hand, may be fairly common. Nonetheless, our data selection rules exclude these events from representation in our sample of "typical" resale properties. Because

we use sales price as an indicator of market value, our selection rules demand that we discard sales that are not "arms' length market" transactions between private individuals. Exhibit II-2 in the previous chapter shows the variety of conveyance types we have chosen to label while regarding only those marked "Private" as appropriate for use. In other words, the RVI summarizes the historical patterns of price changes that have taken place in what we termed "normal" markets in Chapter II. Although there are methods that will allow us to expand the RVI to consider factors such as conversions and conveyance of properties through default entities such as Banks, HUD, or the City, we must first improve our data base further. At any rate, the complexity of urban housing markets cannot be completely described by any single measure.

The Residential Value Index is best used to compare Boston neighborhoods to one another or to the City average since the same rules and methods were used for each RVI. Location is of primary importance in determining housing values and their course of change, and the RVI describes locations within Boston on the basis of such price changes.

The calculation of the Residential Value Index is performed by multiple linear regression. This method considers all the properties of a sample simultaneously, so that even when the two sales recorded for any particular property are years apart, the effects of all intervening years are taken into account. Actual calculations are done by computer.

Because RVI measures growth that occurs with "compound interest" a logarithmic scale has been used in all graphs to make period by period percentage changes clearer. On this scale the distance between one and two is

the same as that between two and four or four and eight. The graph rises or falls by a certain amount in response to a given percentage (rather than absolute) change in the Index.

The Index Problem and a Non-Hedonic Solution

The computation of a price index for a composite "basket" of goods must address two structural problems: the determination of a set of weights that control the influence of each standardized good's price on the composite price for the basket, and the standardization of each good to control for changes in the commodity's quality. The quality problem is especially severe for an index of residential real estate prices, and so we will contend with this issue first and foremost.

Even if we limit our attention to only one type of residential property--such as single family houses--the dimensions of "quality" that influence value are numerous and often difficult to observe or measure. Size, location, age, condition, and the quality of original construction materials and workmanship are important general categories that each contain several aspects demanding attention. If we ignore these factors and attempt to follow changing prices with a simple measure, such as the year by year average price for homes, we may mistake yearly variations in the size or quality of homes sold for more general, temporal phenomena. If an exceptional number of more luxurious homes sold in a particular year, our index would show an unwarranted increase even if these homes might have commanded higher prices had they been sold a year earlier.

A hedonic index should eliminate most of these biases. The way it is constructed is to assert that the price of a commodity depends on several characteristics of the commodity as well as when it is sold. The model might be written

$$1)\quad P_{it} = A_i\, B_t\, V_{it}$$

where P_{it} is the price of the ith property in year t, A_i is a set of numbers which describes the quality of the property, B_t is a price index which is the same for all properties but which changes with time, and V_{it} is an error term which suggests that the model in 1) is not exactly correct. This hedonic approach has been applied with varying levels of success in a number of instances. An increasingly familiar cousin to this method is the modern use of Multiple Linear Regression (MLR) to estimate coefficients for the variables grouped under the label "A" in equation 1) by relating them to sales prices from a single recent time period. Mass appraisal may then be accomplished by applying these coefficients to each property's observed "A" characteristics. But a hedonic index demands detailed property-specific information which we lack. No data: no hedonic index.

A workable solution to the quality control problem can be attained with a non-hedonic index constructed from paired-sales observations. The only time that we can be fairly sure that the basic characteristics of two properties are nearly the same, is if they are, in fact, the same property viewed at two different points in time. Then the price change will represent a change in the price index, rather than differences in the unknown quality variables. This tack was taken by Herman Wyngarden in "An Index of Local

Real Estate Prices" (Michigan Business Studies, Jan. 1927) to chart evolving value patterns for neighborhoods of Ann Arbor, Michigan. Wyngarden used the ratios of later to earlier asking prices for homes offered for sale twice during his study period (termed "price relatives") as his basic unit of observation. Each year's index value was determined as the median price relative for properties having a second asking price in that year, with the relatives for homes first offered later than the base year adjusted by the first offering year's index to normalize all price relatives to the base year. He termed this method "chained link relative". While it is a significant advance over annual average price series, the chained link relative index begs for further improvement. It is inefficient in that it neglects information about the index for earlier periods contained in price relatives with final sales in later periods. Standard errors are left undefined, and there are no clear opportunities for estimating the effects of other factors influencing value change. These problems are largely overcome by a regression approach first described by Bailey, Muth, and Nourse ("A Regression Method for Real Estate Price Index Construction"; Journal of the American Statistical Association; 1963, pp. 933-942) and applied by them to housing data in St. Louis. We use this regression method to compute our Residential Value Index.

Returning to equation 1) and expressing the ratio of prices for a property sold first in period t and again in t' we have

$$2)\quad P_{it}/P_{it'} = \left(A_i/A_i\right)\left(B_t/B_{t'}\right)\left(V_{it}/V_{it'}\right)$$

Notice that A_i will now conveniently disappear, and taking logs of 2) yields

$$3)\quad \log\left(P_{it}/P_{it'}\right) = \log B_t - \log B_{t'} + \log\left(V_{it}/V_{it'}\right)$$

or

$$4)\quad r_i = b_t - b_{t'} + u_{itt'}$$

where $u_{itt'}$ is a function of V_{it} and $V_{it'}$ and may be reasonably assumed to be normal with mean zero, the b's are the logs of the index B, and r is log $(P_{it}/ P_{it'})$. Expressing our combined N observations for years 0 through T in matrix notation

$$5) \quad r = Xb + u$$

where r and u are N dimensional column vectors, b is a T dimensional row vector, and X is size N by T. Each row of X is a set of zeros and ones such as:

$$X_i = (0,0,0,1,0,0,-1,0,0,)$$

where the one and minus one correspond to the t and t' periods. The base year (t=0) column of X has been omitted to avoid exact multicollinearity. Therefore a property first sold during the base year will have a - 1 but no 1 in its row of X.

Equation 5) is just the form we desire for a regression model (without a constant term of course) and we can estimate the b's as $\hat{b} = (X'X)^{-1} X'r$. Equation 5) can be fitted for sales prices, assessments, or their ratio.* Since the X matrix is the same in each case, the index of the ratio of assessments to sales is equivalent to the ratio of the indices for assessments and sales calculated separately. Having performed the regression we obtain our desired index, the B's, by an exponential transformation of the estimated $\hat{b}$'s.

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* This was done by Robert F. Engle using an earlier version of our own Boston data base and reported by Engle in "De Facto Discrimination in Residential Assessments: Boston" (National Tax Journal; December, 1975; pp. 445-451).

Among the immediate benefits of this technique is increased efficiency compared to the chained link relative index. Estimating the annual index values simultaneously rather than sequentially, we utilize information from an observation with sales in years t and t' in estimating the index for intervening years as well as for t'. We also enjoy the advantage of easily calculated standard errors and confidence intervals for the index B's. The proposition that sales prices or assessments have not changed at all in any but a random fashion may be tested with an F statistic for the hypothesis that all the coefficients in 5) are zero. Since our regression is run with no constant term, this F should be calculated as

$$6) \quad F = (I^2/(1-I^2))\ (N-T)/T$$

where

$$I^2 = 1-(u'u/r'r)$$

and

N is the number of observations
T is the number of time periods (excluding the base year)
u is the vector of residuals from equation 5)
u'u is therefore the sum of the squared residuals (a scalar)
r is the vector of dependent variables from equation 5)
r'r is therefore the sum of squared dependent variables (a scalar)

The result of equation 6) is distributed as $F_{T,\ N-T}$ under the null hypothesis. Comparing our calculated F with F_ϵ from a table, we reject the hypothesis that all of our estimated coefficients are zero (i.e. that the B's of our index are all equal to one) if $F > F_\epsilon$. These F statistics for the sales price and assessment indices of Boston's Wards are presented in Table III-1 below.

Table III-1

F TESTS FOR NO CHANGE

Ward	Neighborhood	F Price		F Assessment		Sample Size
1	East Boston	39.44	(1%)	1.54	(-)	308
2	Charlestown	22.88	(1%)	.81	(-)	161
3	Boston Proper	8.87	(1%)	4.64	(1%)	90
4	Fenway-South End	18.95	(1%)	6.96	(1%)	148
5	Back Bay-Beacon Hill	57.56	(1%)	11.28	(1%)	411
6	South Boston-City Point	19.31	(1%)	1.16	(-)	172
7	South Boston-Andrew Sq.	17.53	(1%)	2.65	(1%)	180
8 & 9	Roxbury-North	4.44	(1%)	.70	(-)	103
10	Roxbury-Parker Hill	4.21	(1%)	1.41	(-)	135
11	Roxbury-Egleston Square	2.82	(1%)	1.04	(-)	139
12	Roxbury-Warren Avenue	1.75	(5%)	2.54	(1%)	90
13	Dorchester-Savin Hill	2.02	(5%)	1.74	(5%)	104
14	Dorchester-Franklin Field	1.31	(-)	4.76	(1%)	177
15	Dorchester-Ronan Park	1.92	(5%)	.58	(-)	130
16	Dorchester-Neponset	11.43	(1%)	.79	(-)	140
17	Dorchester-Codman Square	4.18	(1%)	.58	(-)	233
18	Hyde Park	81.48	(1%)	2.75	(1%)	690
19	Jamaica Plain-Roslindale	30.38	(1%)	1.13	(-)	339
20	West Roxbury	>100.00	(1%)	4.24	(1%)	660
21	Brighton-Commonwealth Ave.	27.79	(1%)	1.41	(-)	180
22	Brighton-Allston	51.44	(1%)	1.73	(5%)	282

These statistics are distributed as $F_{T,N-T}$ where T, the number of time peri
excluding the base period, is 20 and N, the sample size, is listed. The signifi
levels (shown in parentheses) indicate the percent of times that we would expect
values of F to be exceeded by chance alone. A 1% significance level therefore i
cates a very strong likelihood (and 5% a strong likelihood) that prices or asses
ments have changed over time. A (-) indicates that evidence of non-random chang
is less conclusive.

These results are consistent with those reported by Engle (op.cit.) for fou
teen Boston neighborhoods over the period 1946-1972. Engle rejected the hypothe
of no systematic price change for all fourteen areas at the 1% level while for
assessments there were six at 1%, two at 5%, and six less conclusive. For our
21 price indices during the period 1955-1975 we find seventeen at 1%, three at 5
and one (-) while our assessment F scores measured 1% for eight, 5% for two, and
eleven (-).

Another virtue of the regression index is its capacity to estimate the effects of quality change events simultaneiously with the temporal effects that we have considered so far. For example: We might hypothesize that some quality change event--such as a major renovation or new heating plant - will, ceteris paribus, increase the value of a home by some given percentage (not absolute) amount. Incorporating this idea into equation 2) we now have

$$7)\quad P_{it/P_{it'}} = (1/A_{i1})\ (1/A_{i2})\ (B_{t/B_{t'}})\ (V_{it/V_{it'}})$$

Since we are interested in improvements that occurred between the two sale years, the A's appear only in the denominators of our ratios. They were not there in period t but they were in place for period t'. A_{i1} can represent major renovation and A_{i2} can represent the new heating plant of our example. If the improvements did not take place then there should be no influence on the relationship between $P_{it'}$ and $B_{t'}$ and so the A's will equal one. We can proceed as before to the regression equation 5), but now the matrix X and the row vector b will have two additional columns. For each row of X the T+1 column will have a zero if there was no major renovation or it will contain a minus one if the property was renovated. The T+1 element of b is really a_{i1}. In addition to providing us with estimates of A_1 and A_2 the addition of quality change to our model should increase the precision of our estimates of the temporal index B's.* The additional burden of data collection, however,

* This treatment of quality change was described by Bailey, Muth, and Nourse (op. cit.) and applied by Bloom, Ladd, and Yinger in "Intrajurisdictional Property Tax Capitalization" (awaiting publication, Harvard University Department of City and Regional Planning). The latter report that the introduction of quality change variables did slightly improve the regression fit.

is substantial. We must know which properties did and which did not undergo the changes of interest. Furthermore, this knowledge should extend throughout our study period. Unfortunately, we are not prepared to incorporate this improvement into our Boston analysis.

Among the problems that we encounter in estimating our Residential Value Index as described is autocorrelation. Durbin-Watson statistics from the regressions are frequently in the vicinity of one, indicating serious positive autocorrelation. Consequently our estimates of standard error and confidence intervals are suspect, but we nonetheless get unbiased estimates of the coefficients $\hat{b}$. The unaccounted for influence of omitted quality and other variables may be responsible for part of the problem. While we might make some improvement in sampling variance by investigating the structur of autocorrelation and then applying generalized least-squares techniques, we have not done so, being content for the moment with unbiased estimates of our coefficients.

Another apparent problem could be "empty years", time periods in which no sale occurred. Clearly, if our X matrix contains a column of all zeros we cannot proceed with the regression, for we will find ourselves trying to inver a singular X'X matrix. This is easily remedied by simply skipping that year, omitting the offending column from the matrix X and the row vector b (the vector of index number logs to be estimated). Of course we must then remember that we have done so when we label and interpret our results.

Updating the Residential Value Index

An inconvenience that we experience in updating our index for new time periods lies in the fact that when we re-estimate the regression with additional data, we not only obtain an index figure for the new period, but also

improve the estimates for earlier periods. The advantage gained through this improvement could be more than offset by the burden that frequent changes in the entire series would place on users of the index. Given the opportunity for frequent updating, we might wish to extend the index for the new periods one by one as they arise, without changing the earlier figures. We could then publicly revise the entire series on a less frequent schedule that balances the inconvenience of change against the advantage of improved estimates. Theory and experience both indicate that the figures most subject to change through re-estimation with later data are those toward the end of the series. Consequently, we might wish to revise the last two members of the established series as we add each new element. The most recent element would be "preliminary", the second most recent "revised preliminary" and the third most recent "revised". At any rate, the regression results would indicate when the changes are of practical significance.

Another approach to updating without revision is a child of the chained link relative method that does not involve regression. Bailey, Muth, and Nourse (op.cit.) convincingly conjecture, although they do not prove, that chain link is nearly as efficient as the regression estimate for late years of the study period. Since there are relatively few sales in still later years (none, for a newest-period update) toward the end of our time range, we do not sacrifice much by ignoring the information about late periods contained in observations with second sale in a still later period. Chained link update is computationally simple and it accepts, rather than improves, estimates for the existing series. The failure of chained link update to change the earlier series is a distinct advantage

when the latest data are of suspect quality, such as we encountered for the first six months of 1979. This situation and our application of the method are detailed in Appendix III-B at the end of this chapter. The formula for chained link update is:

$$8)\ B_{t'} = \sum_{i=1}^{n} \left\{ \left(P_{it'} \Big/ P_{it} \right) \cdot B_t \right\} \Big/ n$$

where B_t is the Index number for year "t"

and t' is the new year we wish to update for

P_{it} is the price for property "i" in year "t"

and n is the total number of sales pair properties in our update sample.

An example: Suppose we wish to update the East Boston (Ward 1) Index from 1975 to 1979. One of the properties sold in 1979 for $30,000 and had been sold in 1970 for $15,000. The price relative is $30,000/$15,000 = 2. Multiplying this relative (2) by the 1970 East Boston Index value (2.241) adjusts it to the 1955 base year. The product of 2 and 2.241 = 4.482 is an observation for the 1979 East Boston Index value. We average all such observations by taking their arithmetic mean* and so arrive at the 1979 update value for the Ward 1 Index.

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* Bailey, Muth, and Nourse suggest using the geometric mean, but we can see no good reason for this. The geometric mean would be appropriate for time-series averaging, but our situation here is essentially cross-sectional. The median is another good candidate for averaging here.

Assumptions and Interpretations; Sample Selection and Weights

There are several assumptions implicit in our Residential Value Index model. First, our model asserts internal homogeneity within each of the several study areas. In fact, any neighborhood that is large enough to provide a sample size sufficient for analysis is likely to be comprised of individual micro-neighborhoods. The boundaries for Boston's twenty-two wards that we relied upon to obtain indices commensurable with our other data were not designed to describe housing sub-market areas. Consequently, we should be prepared to accept an inherently large variance in our average price change estimates. Furthermore, we should select our samples so that each is geographically distributed within its study area so as to properly represent component sub-areas, and we have not yet managed to assure that this is so. Examination of the data shows that they are at least well dispersed across the City's census tracts. In recognition of the heterogeneous study area problem we have computed the R.V.I. for the more suitably drawn Boston Redevelopment Authority (old) Planning Districts (shown in Appendix III-A following this chapter) and for census tracts and tract aggregates (available from B.R.A. Research). We prefer to use the ward indices here because we have complementary data for wards.

The assumed homogeneity also extends across value categories and property types. It is quite possible that single family homes and apartment buildings in an area have not experienced the same history of value change. Thus, in theory, we should compute one index for each and then take a weighted average of the two where the fixed weights could be the proportion of total value in the neighborhood of each type in the base year. The result would lie between the two indices. If the two are run as if they were the same,

then again the result will be a compromise, although not necessarily the same one. If however, we can assume that the sample of paired sales is a random representation of the total properties of the region weighted by value, then the regression results should be approximately correct, although the variances of the induces would be especially large. The annual composition of our samples, by property type, is described in the tables of Appendix III-A. The assumption that different types of property within an area have had similar schedules of price change is testable, and we will examine these tests shortly. The results almost always indicated no significant differences.

Inferences drawn from our indices rely on the assumption that our sample of twice-sold properties represents a random selection from the population. This is somewhat more restrictive than using a sample of properties sold only once even though our study period is fairly long (twenty-one years). We cannot now adequately address the general issue of sample representativeness, except to state that we believe that the results are quite useful, especially for comparative purposes.

Remember also that we have confined our attention to something narrower than the entire universe of residential properties. In our sample selection we have sought "typical" and "essentially unchanged" properties in an attempt to isolate and measure those components of value change that are endogenous to our study areas but exogenous to individual parcels. We could not expect to be entirely successful in this attempt since change is often typical of existing neighborhood housing stock.

Nonetheless, observations were deleted from the sample if deterioration or improvement appeared very "atypical" by either of two sets of criteria:

1) conversion from one occupancy use to another (e.g., from a one-family home to a three-family home);

2) conveyance through a default entity, such as a bank, the City, or HUD. These properties stand a greater than average chance of having experienced a period of vacancy that could result in rapid deterioration. Furthermore, the method of sale could yield a price different from that which the property would command in "normal" markets.

Although properties meeting these two rejection criteria occur throughout the City, we do not know precisely to what extent they have occurred over our period of analysis. Further, they are more likely to be sold than their more staid neighboring properties and so by counting them we might over-represent these rejected parcels in our sample. So the Residential Value Index does not intend, nor should it pretend, to summarize all varieties of local value change factors. We doubt that any single measure is adequate for that task. We prefer to accept a narrower scope in order to better define that scope. In spite of our precautions in sample selection there is some bias in the price indices and so we interpret them as reflecting the average experience of "typical" rather than completely unchanged properties. This bias does not extend to the assessment/sales ratio indices insofar as our actual domain of investigation is understood since assessments should, in theory, keep pace with value changes related to standard local maintenance levels. Acknowledging our self-imposed limitations, we must not forget these groups of excluded properties. Rapidly rising areas generally contain more properties excluded due to conversion upgrading; declining areas have more parcels sliding into default markets and presumably losing value. With assessment changes

that are slight and infrequent our ratio indices will understate the growing disparity among the full populations of neighborhood housing stock.

Testing for Differences Within a Neighborhood Among Property Types

The Residential Value Index summarizes the price change histories of residential properties of all types within each local study area. This begs the question: Is one index adequate for the different types of property or should we compute separate indices? We address this question with Chow* tests of the hypothesis that the modeled regression coefficients are the same for two types of property. First we execute the regression for the two sub-samples together and then for each separately. Then construct

$$9) \quad F = \frac{Q_3/T}{Q_2/(N-2T)}$$

where

Q_1 = the sum of squared residuals from the full sample regressior

Q_2 = the sum of squared residuals from the first sub-sample regression plus the sum of squared residuals from the second sub-sample regression

$Q_3 = Q_1 - Q_2$

T is the number of independent variables (the number of time periods excluding the base period)

N is the full sample size.

The number of observations in the smaller sub-sample must exceed the number of parameters to be estimated, T.** The statistic described in equation 9)

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* See Gregory C. Chow, "Tests of Equality between Sets of Coefficien in Two Linear Regressions," Econometrica, vol. 28, no. 3, pp. 591 605, July, 1960.

** Ibid. Also provides an alternative test for smaller sub-samples, but we shall not pursue this here.

has (T, N-2T) degrees of freedom. If our calculated F is greater than the 95 percent point of the F distribution with the indicated degrees of freedom, then we must conclude that it is highly unlikely that the two sub-sample indices are in fact the same.

We performed these Chow tests within Boston wards in all cases where data were sufficient for the computation of annual indices for property type subsets. The results of these nineteen tests (seven of which were in Back Bay/Beacon Hill Ward 5) are shown in Table III-2. The tests generally indicated that we could not reject (at the .05 significance level) the hypothesis that the indices were the same for both subsets. The only exceptions were found in Ward 5. Here conventional single-family homes* were seen to behave differently from the group of all other residential properties. When lodging houses were removed from the group of all other properties, the significance of difference was somewhat increased--further above the .05 level but not to the .01 point. Comparing single-family homes to all other properties except four or more unit apartment buildings did not yield a significant difference. Focusing attention on apartment properties containing at least four units, we see their index behaving dissimilarly to that for all other properties (at the .01 level) and when we remove single-family homes from the "other" group, the difference is still significant (at the .05 level). We have insufficient data to test (in this manner) the question of whether apartments differed significantly from the subset of other properties that excludes both single families and lodging houses.

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* Condominiums were completely excluded in all of these tests.

Table III-2

TESTS FOR INDEX DIFFERENCES BETWEEN PROPERTY TYPES WITHIN BOSTON WARDS

Ward	Property Types	Sample Size (Full)	F	Significa Level
2	One Family vs. Other	158	1.07	-
5	Lodging Houses vs. Other	387	.88	-
"	One Family vs. Other [2]	387	1.89	5%
"	One Family vs. Other	352	2.22	5%
"	One Family vs. Other Excluding Apts. ≥ 4 Units [2]	241	1.03	-
"	Apts. ≥ 4 Units vs. Other [2]	387	2.92	1%
"	Apts. ≥ 4 Units vs. Other	352	2.72	1%
"	Apts. ≥ 4 Units vs. Other Excluding One Families [2]	222	2.08	5%
6	One Family vs. Other	172	.78	-
7	One Family vs. Other	182	.81	-
10	One and Two Family vs. Other	138	.59	-
11	One and Two Family vs. Other	144	.82	-
12	One and Two Family vs. Other [3]	92	.84	-
18	One Family vs. Other	690	1.26	-
19	One Family vs. Other	339	1.27	-
20	One Family vs. Other	659	1.76	-
21	One Family vs. Other	177	1.50	-
"	Apts. ≥ 4 Units vs. Other	177	1.15	-
22	One Family vs. Other	281	1.18	-

Note: Condominiums were excluded from all samples. Lodging Houses were exclude except where noted otherwise. These two property types are rarely encountered over our study period except in Ward 5. Condominiums ente Ward 5 sample in 1971 and between then and 1975 their trend of value growth is almost identical to that for conventional single family home

1) This is the Significance Level for rejecting the hypothesis that the two Index time series are identical.

2) Other includes Lodging Houses.

3) In Ward 12 the full sample's only lodging house was included in the one an two family homes' sample to attain sufficient data for regression calculations.

Table III-3

RESIDENTIAL VALUE INDICES FOR BOSTON WARD 5 PROPERTY TYPES

	All* Properties	Apartments ≥4 Units	Single Family	All But** Apts., Singles	
1955	1	1	1	1	1955
1956	1.150472	1.152632	1.152947	1.263883	1956
1957	1.280231	1.171025	1.394918	1.261160	1957
1958	1.210260	1.194556	1.291536	1.010444	1958
1959	1.484324	1.229844	1.623441	1.385619	1959
1960	1.580433	1.594044	1.547531	1.370679	1960
1961	1.678696	1.589985	1.752098	1.645471	1961
1962	1.819004	1.691970	1.890982	1.669973	1962
1963	1.972077	1.558226	2.117679	1.983785	1963
1964	2.217766	1.972258	2.158338	2.569382	1964
1965	2.497994	2.005874	2.867308	2.302218	1965
1966	2.457128	2.196953	2.835843	2.274161	1966
1967	2.853520	1.882715	3.433396	2.964502	1967
1968	2.812396	2.207914	3.281339	2.395371	1968
1969	3.170577	2.455457	3.527380	3.421261	1969
1970	3.748797	2.893431	4.195660	3.872887	1970
1971	3.338322	2.451498	4.302552	2.745099	1971
1972	3.705585	3.059539	4.023130	3.365278	1972
1973	4.157557	3.236288	4.805088	4.136845	1973
1974	3.739370	2.846117	4.532693	3.908786	1974
1975	3.778048	2.578262	4.887926	4.035477	1975

The sample sizes for these four regressions were 387,146,165, and 76 respectively and the associated F scores (as in Table III-1) were 55.67, 73.07, 67.91, and over 10

* Condominiums were excluded in all cases since we regard them as comprising a distinct property type and they do not enter our sample until 1970.

** These are two and three family homes and lodging houses.

Table III-3 shows some of the Ward 5 indices that we have just discussed. The single-family index lies above that for the full sample in every year but one. The apartment index equals or exceeds that for all properties in only one year since 1960. Since 1967 the apartment index fell short of the lower bound of a 95 percent confidence interval* for the full-ward index, as well as for the one-family index. The single-family home index exceeded the upper bound of apartments' 95 percent confidence interval in every year since 1967. In no case, however, did these confidence intervals fail to overlap. Clearly, our simplifying assumption of

* Of course our sampling variances are suspect due to the autocorrelation in our regressions. These statements about confidence intervals should be cautiously regarded as simple descriptions of admittedly flawed calculated results.

cross-class homogeneity within study areas is inappropriate here. We should construct the Ward 5 Residential Value Index as a weighted average of two R.V.Is: one for apartment properties and another for all other properties. This is easier said than done and the task will have to wait. We can be somewhat cheered by the fact that the full sample RVI is a compromise between the two subset indices that we would like to combine more elegantly. Although the Chow tests indicate that more detailed methods are advisable, they do not prejudice the issue of whether our present estimates are close to "correct".

The Boston City Residential Value Index

The City RVI was figured as a linear combination of the indices for Boston's sixteen Planning Districts. Each Planning District was weighted by its proportion of City dwelling units. Dwelling unit counts were prepared by BRA Research from the U.S. decennial census, with the intercensus year counts being linearly interpolated. The dwelling unit count and resultant weights are tabled in Appendix III-A.

The choice of BRA Planning District components was dictated largely by precedent and convenience. Since the initial publication of the RVI in 1973*, the Planning District indices have been widely circulated. These Planning Districts have been used to delimit complementary housing, population, and public investment data, all of which played a role in determining the district boundaries.

* "Residential Property Market Values in Boston", by Robert Engle and John Avault, BRA Research, 1973.

Our weights of choice would be the proportions of total housing stock value in each area. In fact, we would like to define our actual domain of "typical" properties quantitatively and use them as our basis for weighting while describing the other properties commensurably (or in the same series, using more complete data and additional regression dummy variables, as described above). We have not been able to afford these luxuries and we lack the necessary confidence in our total value estimates over the length of the analysis period. We used the most suitable weights that we found available. The use of floating rather than fixed weights demands some comment. While fixed weights are virtuous for defining a precise "basket" of goods to be priced, our basket is self-defined: the City's entire housing stock. We feel that the year-by-year changes in the index are more meaningful if each year is appropriately weighted. Furthermore, as units enter or leave the universe of Boston housing they also enter or leave as sample selection candidates. Although certain "atypical" properties are excluded from our sample, we presume that the property exogenous and locally standard maintenance related value patterns reflected by the RVI apply to them also, although confounded by other influences. We have not tried to modify our weights for their presence.

In summary: We define the Boston City RVI as a measure of the average year by year change in current dollar value for existing housing units due to property exogenous and locally standard maintenance levels as reflected by typical properties that have been sold twice in the course of the analysis period.

Data Sources

The primary source for Boston property sales records is the Suffolk County Registry of Deeds. We used two secondary sources derived from the Registry. The Metropolitan Mortgage Bureau's Appraisers' Weekly cards cover the period 1955-1974. The BRA possesses a set of these cards and they are filed chronologically for individual properties which are in ascending street number for alphabetical streets by neighborhood. Sales from 1975 were organized by our SALES information management system from the Property Sales Reports to the State Tax Commission prepared by the Boston Assessing Department. Both of these sources are detailed in Chapter II. Only arm's length private market sales with complete information (labeled "P" earlier in Exhibit II-2) were used. Mixed use properties (both residential and commercial) were not allowed. Properties undergoing conversion or default were excluded, as described earlier in this chapter. Properties sold three times were counted as two pairs: 1) first and second sales, 2) second and third sales.

The collection of paired sales observations can be tedious and it is greatly aided by well-organized records. Observations with a second sale in 1975 were gathered in the process of interfiling computer-printed index cards of 1975 sales with the Appraisers' Weekly set. This leaves the 1975 sales conveniently available as first sale candidates, along with sales from earlier years, to aid in future RVI updates. The future usefulness of the Residential Value Index depends upon its maintenance through update and this in turn depends upon the availability and organization of sales records. The last year for which we have sufficiently complete machine readable or card-formatted data is 1976 (HMS-SALES).

Procedures and Programs for Computing the Residential Value Index

Calculation of the Residential Value Index is accomplished with the aid of two on-line computer programs. Program PVAL reads the file of primary data and selects observations from specified study areas, detailing each area with descriptive tables and creating secondary files of each area's data transformed for regression analysis. Program INDEXJ inputs one or more of PVAL's output files and performs the regression, subject to several control options. Appendix III-C contains listings of these two annotated programs and a catalog of files and programs.

The primary data file read by PVAL now contains 4,891 observations spanning the years 1955 through 1975. Each observation is comprised of twelve elements: Planning District, Ward, and Census Tract of location; an identification number within Planning District sets; a property type code distinguishing among condominiums, one to three family residences, and apartment buildings; number of dwelling units; two sales years; two prices; and two assessed values. For each of six user specified areas PVAL prints two tables at the user's terminal showing for each year 1) the number of first, second, and total sales along with mean assessment/sales ratios and standard deviations and 2) the number of properties sold by type, and their mean prices. Tables describing the sixteen Planning District data sets can be found in Appendix III-A. Data from each study area are filed for subsequent regression analysis as: Planning District and observation identifiers, number of dwelling units, number of years between sales, dependent variables for price and assessment indices (natural logs of the ratios of second to first values), and the

vector of independent variables (a row of zeros, one, and minus one).

The user of program INDEXJ specifies on line any number of PVAL output files for input and analysis. Other interactive specifications define the study period and request a printed variance-covariance matrix and list of residuals, if desired. Exhibit III-1 illustrates this process and its product for a Residential Value Index of Lewis Wharf condominium sales (Boston's waterfront in Ward 3) between 1974 and 1979. Residuals may be seen in raw form (in terms of the logs of relative prices and estimated index values) or transformed to terms of relative price changes and relative index values. The transformed residuals, calculated as the ratio of index estimates for an observation's two sales years minus the ratio of actual sales prices, are generally more useful, especially when viewed as the ratio of residual to predicted price relative. The continuation of Exhibit III-1 shows the transformed residuals for the Lewis Wharf condominium index. Residuals are listed in sequential order of observation input and may be compared to an observation list that can be printed from PVAL with programmer specification. Additional programming in PVAL to sort and order observations by price level or property type can also enhance the usefulness of the residuals list. Comment statements listed at the top of program INDEXJ (see Appendix III-C) give instructions for program specification of: assessment rather than sales price index, index series output to file, processing of only selected property types.

Exhibit III-1

PROGRAM INDEXJ IS USED TO CALCULATE A RESIDENTIAL VALUE INDEX FOR
LEWIS WHARF CONDOMINIUMS

```
R
DATE: 80-205; TIME: 15:55:08.5; REL3: INDEXJ.VSBASIC
HOW MANY FILES?
?
1
ENTER ONE FILENAME.   ?
IPD1
ENTER # OF TIME PERIODS, STARTING YEAR AND INTERVAL, E.G. 30,1946,1?
6,1974,1
DO YOU WANT A VAR-COVAR MATRIX?   ?
NO
DO YOU WANT RESIDUALS?   ?
YES
DO YOU WANT RESIDUALS TRANSLATED (1), OR RAW(2)?
1
  ***** PROPERTY VALUE REGRESSION *****

INDEX      MEANS          STANDARD DEVIATIONS
  2        - .174603          0.459301
  3         0.047619          0.580005
  4         0.190476          0.618456
  5         0.206349          0.513015
  6         0.222222          0.419079
  1         0.222263          0.163510


INDEX      B              STD. ERROR      T-RATIO
  2        0.001272         0.039697       0.032049
  3        0.093858         0.030897       3.037795
  4        0.184371         0.030670       6.011368
  5        0.249859         0.033758       7.401452
  6        0.530899         0.039629      13.396820


F FROM I2(ADJUSTED) -  46.6762     R-SQUARED -              0.436307
NUMBER OF OBS. -       63          NUMBER OF INDEP VAR      5
STAND.ERROR OF EST. -   0.127944   D.F. -                  58
SUM SQ. RESID. -        0.949448   F =                      7.224134

********************** PRICE INDICES **********************

  YEAR          INDEX       RANGE OF 95% CONFIDENCE INTERVAL
1974-1974       1
1975-1975       1.001273      0.924851       1.084010
1976-1976       1.098404      1.032584       1.168419
1977-1977       1.202461      1.130919       1.278530
1978-1978       1.283844      1.200026       1.373517
1979-0098       1.700460      1.570889       1.840719

************************************************************

DURBIN-WATSON STATISTIC=  1.581
```

Exhibit III-1 (Cont'd)

THESE ARE NOT REAL RESIDUALS; THEY ARE POST-TRANSFORMATION DIFFERENCES

ACTUAL	PREDICTED	RESIDUAL	RES/PRED	OBSERVATION
1.329412	1.202461	0.126950	0.106	1
1.108786	1.001273	0.107512	0.107	2
1.317991	1.202461	0.115530	0.096	3
1.276922	1.097007	0.179915	0.164	4
1.138933	1.202461	- .063528	- 0.053	5
1.150000	1.098404	0.051596	0.047	6
0.956633	1.098403	- .141770	- 0.129	7
1.313364	1.200933	0.112432	0.094	8
1.076692	1.202461	- .125770	- 0.105	9
1.020689	1.202461	- .181772	- 0.151	10
1.406299	1.202461	0.203837	0.170	11
1.256830	1.098404	0.158426	0.144	12
1.595744	1.200933	0.394812	0.329	13
1.017857	1.001273	0.016583	0.017	14
1.371736	1.202461	0.169274	0.141	15
1.190475	1.098404	0.092072	0.084	16
1.187709	1.282211	- .094502	- 0.074	17
1.158129	1.098404	0.059725	0.054	18
1.114285	1.200933	- .086647	- 0.072	19
1.050505	1.200933	- .150428	- 0.125	20
1.000000	1.202461	- .202461	- 0.168	21
1.180555	1.283844	- .103289	- 0.080	22
1.346153	1.202461	0.143692	0.119	23
1.204933	1.098404	0.106529	0.097	24
1.063291	1.098404	- .035113	- 0.032	25
1.171875	1.200933	- .029058	- 0.024	26
1.165048	1.200933	- .035885	- 0.030	27
0.950653	1.098403	- .147750	- 0.135	28
0.942857	1.098403	- .155546	- 0.142	29
1.039360	1.098404	- .059044	- 0.054	30
1.260174	1.283844	- .023670	- 0.018	31
1.216216	1.200933	0.015284	0.013	32
1.067362	1.202461	- .135099	- 0.112	33
1.268781	1.200933	0.067848	0.056	34
1.097973	1.098404	- .000431	- 0.000	35
1.501204	1.548120	- .046915	- 0.030	36
1.008547	1.283844	- .275297	- 0.214	37
1.609091	1.698298	- .089208	- 0.053	38
1.840278	1.698298	0.141979	0.084	39
1.893082	1.700460	0.192621	0.113	40
1.298904	1.283844	0.015060	0.012	41
1.175812	1.414149	- .238338	- 0.169	42
1.515151	1.414149	0.101002	0.071	43
1.108695	1.168827	- .060132	- 0.051	44
1.443478	1.548120	- .104642	- 0.068	45
1.505174	1.324507	0.180667	0.136	46
1.628571	1.548120	0.080451	0.052	47
1.128204	1.067679	0.060525	0.057	48
1.256818	1.324507	- .067689	- 0.051	49
1.341084	1.283844	0.057240	0.045	50
1.389473	1.094736	0.294737	0.269	51
1.250000	1.414149	- .164149	- 0.116	52
1.165048	1.067679	0.097368	0.091	53
1.676470	1.324507	0.351963	0.266	54
1.149606	1.168827	- .019221	- 0.016	55
1.521253	1.283844	0.237409	0.185	56
1.091525	1.282211	- .190686	- 0.149	57
1.261744	1.548120	- .286375	- 0.185	58
1.287355	1.067679	0.219676	0.206	59
1.184732	1.168827	0.015905	0.014	60
1.301009	1.168827	0.132182	0.113	61
1.785714	1.700460	0.085254	0.050	62
1.422222	1.067679	0.354543	0.332	63

An Introduction to Tax Capitalization

The effect that property taxes might have on property values is called property tax capitalization. This term is most commonly used to refer to the assertion that, all other things remaining equal, a property could be sold for a higher price if its present and future property taxes were lower and it would sell at a lesser price if its taxes were higher. Consequently, if we raise (or lower) a property's tax bill and if nothing else changes (an impossible if, of course) we would expect the property value to decline (or rise) in response. We have two special reasons for being concerned with the tax capitalization hypothesis: 1) If tax changes due to revaluation are capitalized into significant value changes then the new assessed values, based on the old and now changed property values, will have automatically have made themselves obsolete and we will have missed the mark. We wonder if this could cause problems for the revaluation process and for property owners. Even if a second revaluation accurately adjusted all assessments, some price would have to be paid for the effort and uncertainty. 2) If higher taxes cause lower values then property owners will find their wealth as well as their income affected by new tax bills. They would enjoy both lower taxes and higher values or suffer both higher taxes and lower values. By learning more about this possibility we might become more able to protect public welfare and security.

We do not know how, or even if, property tax changes resulting from revaluation will be capitalized into property values. We suspect that some capitalization will occur; in fact it may be happening now as uncertainty and anticipation influence prices set in the market. In the rest of this section we will examine the tax capitalization issue from a non-specialist's

point of view. We will try to show that the general idea of capitalization is not at all mysterious or exotic and that the idea of property tax capitalization can be understood in common and sensible terms. Even though we do not know if, how, or how much tax capitalization will happen, we can make some informative estimates of "what would happen if...?" Finally we will point out some factors that make automatic adjustments for property tax capitalization or offset its effects.

The general process of capitalization is no stranger to most of us. Recent increases in energy costs provide two common examples of costs that are capitalized into values. As gasoline prices rose and showed promise of further rise, consumers responded in the marketplace by bidding up the prices of fuel efficient used cars and lowering the prices they were willing to pay for second hand "gas guzzlers". The increased operating costs associated with driving a big car rather than a smaller one were capitalized into lower values. Even though fuel costs rose for small cars too, the increased costs were relatively less since fewer gallons of the more expensive fuel are required for yearly driving. The comparative savings that a motorist could enjoy through better gas mileage now means more dollars saved at the gas station each month and this increase in comparative savings is capitalized into a value increase. Another example of capitalized rising energy costs may be seen in local housing markets. To the extent that well-insulated and efficiently heated homes enjoy an enhanced competitive position when offered for sale, we can see capitalization of ownership costs at work.

Pinning numbers on capitalization can be difficult. Capitalization is a trade-off process: It means trading a price now for a future stream of costs or benefits. We will want to know what those future costs or benefits are and also what trade-off rate is appropriate. One of the simplest illustrations of how this works with numbers is the funded annuity. Let us imagine that our rich uncle invests $100,000 with a promise of an annual yield of ten percent, to be paid to us every Christmas. When we get our first check for $10,000 we might well wonder how much money dear uncle has set aside to provide for us so. Although the institution administering the fund will not divulge its amount, they tell us that the annual yield or interest rate is ten percent. We quickly figure that the fund is $100,000 by dividing our annual benefit ($10,000) by the annual rate of return (10 percent). $10,000/.10 = $100,000. Given any two of these three numbers--benefit (or cost, the other side of the coin), rate of return, and price (which we might call present value)--we can calculate the third. If we did not know our fund's rate of return we might guess at the rate and thereby arrive at a guess as to the fund's value. If only an unknown part of our Christmas present were derived from the fund's earnings and if the rate of return were variable and not a constant ten percent per year, and if the size of our check were different each year, our guessing game would be made more difficult and more like the problem of estimating property tax capitalization effects.

Even in the more technical sections that conclude this chapter, we stick to a very simple model of property tax capitalization. After all, we do not know how it actually works in the complex real world and we doubt that it would always work the same way in differing circumstances. Many

social scientists talk about tax capitalization, quite a few have looked for it, some think they found it, but hardly anyone claims to know all about it. It must be understood that we are not trying to predict the ultimate effects of tax capitalization. Rather, we wish to illustrate the practical implications of our simple core assumptions. We hope that our readers will be better able to form their own opinions if we give them a comprehensible starting point. Our most basic assumption is that people like to make or save money and that we can impute a present value to a stream of future savings or earnings by a capitalization process such as we have just described. For homeowners we will phrase the process in terms of a desire to save money on tax bills in the context of limited household budgets for housing expenses. For owners of income properties such as apartment, store, and office buildings we will view the process in terms of the need to earn profits on their investments in the context of competing investment opportunities with associated rates of return. We can show this at work with two examples that demonstrate how property tax bills can affect the affordability of homes and the profitability of income properties in ways that could influence values.

Two major components of home ownership expenses are mortgage payments and property taxes. When purchasing a home the buyer must select one that the household can afford; that is, the sum of periodic tax and mortgage payments must not exceed the allowable outlay available from family income. Mortgage terms of 8¼ percent for a twenty year repayment period were fairly typical at the start of our study period (1974-1977). Constant payment tables show that these terms demand monthly payments of $8.678 for every

$1,000 mortgaged. This is $104.13 per year for every $1,000 mortgaged or 10.413 percent of the mortgaged amount to be paid annually. In this example and in all subsequent calculations for one, two, and three family homes, we will treat the entire purchase price as if it were mortgaged under these terms. Of course homes are usually purchased with a down payment. What we are really doing is assuming, for the sake of simplifying our calculations, that the buyer's "opportunity cost of capital" is the same as the cost of financing the amount mortgaged. This opportunity cost is the interest rate that the down payment amount would otherwise be earning or saving the buyer. The down payment is figured into household budget just as mortgage and tax payments are. We must now ask what happens if tax bills change. Imagine that a home's taxes increase by $1,000. The owner may be able to meet this added expense by cutting back on other budget items (perhaps home maintenance) or he may decide to sell. If he tries to sell he will encounter prospective buyers who have incomes and housing expense budgets similar to his own. Since the taxes are $1,000 higher, the amount of annual housing budget available for mortgage payments will be $1,000 less. In order to reduce annual mortgage payments by $1,000, the buyer must agree to a purchase price that is $9,615 ($1,000/.104) less than he could have afforded to pay without the tax increase. Note that the current owner's mortgage terms play no role here. It is the cost of buying that influences buyers' offers. The sale price of the house has declined but the housing budget required to buy the house has not changed.

We treat properties other than one, two, and three family homes as investments purchased for the sake of the income they produce. We assume that a twelve percent rate of return is expected on the purchase price investment to compensate the buyer for interest that his money could earn elsewhere, property depreciation, and the risk and management burden associated with real estate investment. A property yielding a net annual income of $10,000 would therefore be worth $83,333 ($10,000/.12) to an investor-buyer. Investment property sales value depends on net income and net income can change due to property tax changes. If an investment property is subject to a $1,000 tax expense hike, its income net of all expenses will drop by $1,000. If this property were now sold to another investor, the new buyer would demand a price $8,333 ($1,000/.12) lower than he would have agreed to without the tax increase.

These two examples illustrate our core capitalization model. As simple as it is, there is a special complication that arises due to the fact that assessments, and therefore taxes, are to be based on market values while at the same time taxes can influence values. Let us return to our first example and suppose that our illustrative home's $1,000 tax increase was based upon an assessed value that accurately reflected a $50,000 market value. Since the tax increase results in a value decline of $9,615 in our example, the property's market value is now $40,385 and so it is now over assessed. Reassessing the house on the basis of this new market value will lower its tax bill and thereby raise its value, although not to the original $50,000 level. But now we must reassess the house again in response to this latest change in value and so cause still another value change

The later sections of this chapter show that theory expects these up and down changes to grow smaller at each step (with some qualifications) and finally settle down to a point where market value, tax bill, and assessment are in balance, or equilibrium. In fact we can easily calculate, for our simple model, just where this equilibrium will lie. The idea and the actual levels of equilibrium are especially important to the goal of property tax equalization since this goal is the accurate and uniform reflection of market values in assessed values and tax bills. All our estimates of property values and taxes that account for tax capitalization refer to equilibrium levels within our basic model, unless otherwise noted.

The chain reaction process just described of successive adjustments of taxes and values that eventually leads to equilibrium is called iterative because it proceeds step by step. The behavior implicit in this process is that assessors repeatedly value properties at current market values with no regard for tax capitalization consequences and that property buyers and sellers fully capitalize tax changes at each step as if they expected the new tax bills to be permanent. An alternative behavior process that contrasts with the iterative scenario is called steady state. In the steady state scenario, assessors anticipate tax capitalization responses in establishing new assessments while property owners and buyers anticipate that future taxes will be adjusted to equilibrium levels through appeal or reassessment. If assessors miss the equilibrium target on their first try they will hit it with the next adjustment since the market will value properties at equilibrium in anticipation of adjustment.

We expect that reality lies somewhere in between these two extremes of iterative and steady state behaviors as we have described them.* Whatever path is actually followed to equilibrium balance, the final result is the same for our simplified model. Both iterative and steady state processes yield identical equilibrium values and taxes in the end as long as nothing else happens to influence taxes or values while these processes transpire over time. In this respect they are the same. But when we abandon the "nothing else happens" simplification, a number of differences arise. Since the iterative scenario requires that values and taxes spend some time jumping up and down in disequilibrium, taxpayers would experience greater difficulty in planning budgets generally, and in paying tax bills during the periods when taxes would be temporarily above equilibrium. Household budgets and commercial cash flows would be strained for properties taxed on the high side of equilibrium while properties taxed on the low side would be favored, but only temporarily. Decisions to buy, sell, move, invest, maintain, or abandon could be made unwisely if temporary bills were thought permanent. Significant market distortions might arise and they would be magnified as

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* Our purpose in presenting these two scenarios as extremes is two fold: The strict versions are simpler to describe both in words and in equations. Also, since the equations for both behavior extremes have the same equilibrium tax and value solutions (as shown later) we infer that different compromise combinations of the two will yield that same solution too. Both iterative and steady state images have been employed in earlier speculative works on revaluation in Boston. "Simulating the Economic Impacts of Revaluation in Boston" by Kenneth Cooper and Robert Weinberg (Federal Reserve Bank of Boston, 1975) is built around a more elegant iterative model. "Estimating the Impact of Full Value Assessment on Taxes and Value of Real Estate in Boston" by Daniel Holland and Oliver Oldman (from Metropolitan Finance and Growth Management Policies: Principles and Practice, edited by George Break; University of Wisconsin, 1978) describes both iterative and steady state while basing calculations on the latter approach.

entire neighborhoods and types of property tended to shift up or down together so that supply and demand patterns are disturbed. To the extent that disequilibrium taxes are perceived as temporary, iterative oscillations and people's reactions would be moderated. Softened by caution, the swings of the iterative pendulum could still exact a social cost as uncertainty about future tax burdens persists from before revaluation. The iterative scenario would also have a higher price tag for City property tax administration, requiring more reassessments and appeals processing. This caricature of iterative adjustments indicates that the steady state path is not only shorter but also less painful and less expensive.

The causal difference that separates these two scenarios of iterative and steady state is assessors' and the market's anticipation of interrelated tax and value changes. Some forms of anticipation are likely to occur automatically, favoring the likelihood of steady state adjustment. The income capitalization technique that is often used to appraise or check the appraisal of commercial properties inherently contains an equilibrium tax capitalization mechanism. Recall that in our earlier example of a commercial property experiencing tax capitalization we saw that an investor (or an assessor) might value a property on the basis of its after-tax net income. This can be done by subtracting property taxes and operating expenses (but not mortgage payments) from annual gross rental income to obtain net operating income, and then dividing this last figure by an appropriate annual rate of return (the capitalization or "cap" rate). Of course, taxes passed through to tenants must be accounted for as income. An equivalent (and for our purposes, easier) calculation is to divide net income before payment of property taxes by a total cap rate that is the sum of the investors' cap

rate and the property's effective tax rate (the percent of property market value payable each year for taxes). Using the equalized effective tax rate that will apply after revaluation, the property's equilibrium value that is in balance with the new tax bill can be obtained. The following sections of this chapter outline these calculations. If equilibrium values and taxes are thus figured for income properties, large portions of the tax base and property levy in Boston and other employment and rental housing centers would follow the steady state path.

Private markets for non-income properties, such as owner-occupied homes, may capitalize anticipated tax changes before revaluation takes place. If the publicity preceding revaluation informs the public of the probable direction and general magnitude of forthcoming tax changes, and if potential buyers adjust their price bids accordingly, then the market prices that help assessors determine new valuations could reflect the equilibrium values consistent with future tax bills. A program of phased-in tax changes--such as that initiated by Boston for the 1980-81 tax year--would provide an opportunity for markets to capitalize part of the final tax bill changes prior to full equalization. The phase-in could stimulate advance capitalization of anticipated further tax changes as well, by increasing public awareness of future tax shifts. To the extent that anticipatory capitalization takes place early enough to influence market prices used by assessors for revaluation, it will favor the steady state outcome.

Some time lag between changing market prices and changing assessments is inevitable; it takes time to collect, organize, and use the market data.

Consequently, anticipatory capitalization that takes place at the eleventh hour has little chance to influence revaluation assessments. But this "assessment lag" could have another effect that might offset somewhat the equilibrium adjustment problem. As we saw in the first sections of this chapter, the combination of static assessments and varying value growth rates results in the eventual relative under assessment of fast growing properties and neighborhoods and relative over assessment of slow growing or declining properties and neighborhoods. The homes that now face the larger proportional tax increases from equalization will tend to be those which have grown in value more rapidly in the past and might otherwise grow more rapidly in the near future. It follows that the properties that face the greater tax capitalization value losses will also be more able to make up for that loss over time--including the time of assessment lag. A hypothetical example will illustrate this point: A house worth $30,000 five years ago can now sell for twice that amount. Its value has grown by fifteen percent annually (compounded annually) and this rate of value increase seems likely to continue for at least a few years. The assessor notes the property's $60,000 current value and a year and a half later the home's annual tax bill shows a $1,450 increase due to the new $60,000 assessment. If the tax increase were capitalized at a 10.4 percent rate the value loss would be $13,942. But over the year and a half period of assessment lag, the home would have increased in value by $13,994 so the two elements of value gain over time and value loss through capitalization almost exactly offset one another and the assessment and price are in close agreement at equilibrium. It is rare indeed for the real world to keep its balance

books as neatly as in our example; but the directions, if not the magnitudes of these two value change forces will often favor the steady state outcome.

A final mechanism for pursuing the steady state path to equilibrium is formal anticipation of capitalization by assessors. For rental income properties this can be automatically accomplished by income capitalization valuation. Income capitalization is not as easy in reality as in our simplified example, and disputes often arise over the determination of incom and expenses and the choice of an appropriate capitalization rate; but the process is not made more difficult by seeking tax capitalization equilibrium values. Tax capitalization is built into the income capitalization calculations. Properties not representing investments for income pose more of a problem. Assessors might use calculations analogous to those described in this chapter, while at the same time making allowances for anticipatory mark capitalization and value changes during assessment lag. The calculations would necessarily be more complex than ours since our simplified tax capitalization model was designed to illustrate a basic theory rather than predict or explain an actual situation.

Among the questions that would have to be addressed before attemptin predictions: Are tax changes fully capitalized or is only a portion of the change translated into value? A homeowner itemizing federal income tax deductions will share any property tax change with Uncle Sam. Prospective buyers in a forty percent marginal income tax bracket might capitalize only sixty percent of a property tax change. Expectations of further property tax changes could also result in under-capitalization or over-capitalization What are appropriate tax capitalization rates? Are capitalization rates

different for different types of property and neighborhoods? How do cap rates change over time? What role do expected changes in housing costs play in cap rate determination? Will absolute full dollar amounts of tax change be capitalized into value or will relative (compared to an average within a competitive submarket) changes be capitalized? A home experiencing a tax increase may go up in value if similar properties receive larger increases. For simplicity, we have described tax capitalization for homes in terms of fixed housing budgets. However, household budgets do change and the way that households divide overall budgets among housing and other costs can change too. These difficult questions have been asked before and answers have been proposed for some of them.* Both the questions and answers merit careful consideration before prediction is attempted.

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* See especially "Intrajurisdictional Property-Tax Capitalization" by Howard Bloom, Helen Ladd, and John Yinger; John F. Kennedy School of Government, Harvard University; 1980. The authors examined seven Massachusetts communities that revalued assessments between 1967 and 1974. They also summarize the methods and findings of other property tax capitalization studies. They conclude "that taxes are, to a large degree, capitalized into house values".

A Simple Model of Tax Capitalization

The capitalization of property taxes and of tax-financed public services and investments into property values have been topics of speculative and empirical study for at least half a century.* Our intent here is neither to introduce new theory nor to report an empirical examination of tax and value relationships. Rather, we wish to show the implications of a simple hypothetical tax capitalization mechanism incorporating "ball park" parameter for Boston and other Massachusetts communities where assessment equalization will result in substantial tax bill changes within the next few years. The following pages describe our core capitalization relationship, chosen for its simplicity rather than elegance. Two behavioral dynamics, termed "iterative" and "steady state" are applied to this relationship and are shown to lead to identical solutions under certain assumptions. Finally, a few of the structural shortcomings of our model are examined and the implications of a m general specification are considered.

The illustrative calculated results of interdependent tax and property value changes derive from the relationship:

$$V = \frac{R-T}{C}$$

where V = the market Value of a property or property category

T = the annual Tax bill for the property or category

R = net annual Return before Taxes for income properties or, the other side of the same coin, imputed Rent for owner-occupied residences. When viewed as Rent, R is taken to be the sum of annual mortgage and tax payments figured as if the entire market Value purchase price were financed.

C = the Capitalization rate. We have arbitrarily (but we think not too unreasonably) assumed capitalization rates of 10.4 percent for one, two, and three family homes and 12 percent for all other realty. The 10.4 percent figure is the annual constant payment rate for an amount mortgaged for twenty years at 8¼ percent.

* Ibid, Chapter 2, presents

By initially assuming that no part of any tax change is passed through to the tenants of income properties and that the potential buyers of one to three unit residential properties can or will pay only a fixed amount for the sum of annual mortgage and tax bills we have

$$\underset{0-1}{\Delta} V = - \underset{0-1}{\Delta} T/c$$

where the symbol $\underset{0-1}{\Delta}$ means the change from time period zero to period one. We will allow no value changes due to changing levels of tax supported services by requiring that the total tax levy and municipal services remain unchanged.

Iterative Adjustment to Equilibrium

The iterative mechanism consists of a series of sequential tax and value adjustments. In this scenario the assessor revalues all properties to or in proportion to their current market values to achieve uniformity of effective tax rates. For convenience we will stipulate that the jurisdiction's average or desired effective tax rate remains constant during the ensuing process. Buyers of revalued properties promptly capitalize the full dollar amounts of all tax changes in inverse proportion to capitalization rates which we will also require to remain constant over the adjustment periods. After the initial tax changes and resulting value changes another set of assessment and therefore tax changes is administered to reflect the new market values just established and revealed in the market. This is followed by further rounds of value and tax adjustments, ad infinitum, in a strict ceteris paribus environment. To express this more concisely we introduce the symbols

e = the equalized effective tax rate to be set by policy

e' = the effective tax rate borne by a property in period zero before the initial tax change

$\underset{0-E}{\Delta}$ = indicates change from the zero period to Equilibrium where no further change is required of either Taxes or Values.

The process* begins with the initial tax change:

$$\underset{0-1}{\Delta}T = V_0 e - V_0 e' \quad (1)$$

$$\underset{0-1}{\Delta}V = -\underset{0-1}{\Delta}T/c \quad (2)$$

$$\underset{1-2}{\Delta}T = \underset{0-1}{\Delta}Ve = -\underset{0-1}{\Delta}T\,(e/c) \quad (3)$$

$$\underset{1-2}{\Delta}V = -\underset{1-2}{\Delta}T/c = \underset{0-1}{\Delta}T(e/c^2) \quad (4)$$

$$\underset{2-3}{\Delta}T = \underset{1-2}{\Delta}Ve = \underset{0-1}{\Delta}T\,(e/c)^2 \quad (5)$$

$$\underset{2-3}{\Delta}V = -\underset{2-3}{\Delta}T/c = -\underset{0-1}{\Delta}T\,(e^2/c^3) \quad (6)$$

$$\underset{3-4}{\Delta}T = \underset{2-3}{\Delta}Ve = -\underset{0-1}{\Delta}T\,(e/c)^3 \quad (7)$$

And so we see that

$$\underset{0-3}{\Delta}V = (-\underset{0-1}{\Delta}T/c)\left[1-(e/c) + (e/c)^2\right] \quad (8)$$

$$= \underset{0-1}{\Delta}V\left[1-(e/c) + (e/c)^2\right]$$

$$\underset{0-4}{\Delta}T = \underset{0-1}{\Delta}T\left[1-(e/c) + (e/c)^2 - (e/c)^3\right] \quad (9)$$

And in general

$$\underset{0-n}{\Delta}V = \underset{0-1}{\Delta}V\left[1-(e/c) + (e/c)^2-(e/c)^3 + \ldots.(e/c)^{n-1}\right] \quad (10)$$

$$\underset{0-n}{\Delta}T=\underset{0-1}{\Delta}T\left[1-(e/c)+(e/c)^2-(e/c)^3+\ldots.(e/c)^n\right] \quad (11)$$

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* This notation and expression of sequential adjustments are those presented by Dennis J. Dickstein in an unpublished paper "The Effect Property Taxes Have on Property Values: A Study of a Specifi Situation"(MIT, 1974) and later employed by Holland and Oldman(op.c

At each stage of the adjustment process the period by period change in Value or Taxes depends upon the "initial impact" change and the ratio of effective tax rate to capitalization rate (e/c) which occurs with alternating sign and in increasing powers. If the capitalization rate is greater than the effective tax rate then (e/c) will be less than one and increasing powers of this ratio will become progressively smaller. The size of Value and Tax changes will diminish at each step and the bracketed series in equations (6V) and (6T) will converge. This convergence will be more rapid for smaller (e/c). If capitalization and effective tax rates are equal the series will not converge but will oscillate with constant amplitude since $(e/c)^n=1$ for all n. Successive changes in Value or Tax will be of constant magnitude but alternately positive and negative direction. Where the effective tax rate exceeds the capitalization rate the series diverges and we would eventually encounter an alternation of increasingly negative Values and Taxes, were these possible. These last two unlikely scenarios refer to truly confiscatory equalized property tax rates that yield the City a return on investment value greater than or equal to the investors' and confront homeowners with tax bills at least as high as periodic mortgage payments. As we try to imagine such an extreme situation we might also imagine assessors and property owners who anticipate future changes so that tax changes are not fully capitalized in one adjustment period and value changes are not fully translated into assessments in one period. If property owners capitalize only half of a tax change in one period, the effective capitalization rate in equations (1-6V) will double; if assessors show equal restraint the effective tax rate for single period adjustments in equations (1-6T) will be halved. This does not preclude eventual full capitalization and equalization.

For practical purposes we can regard the bracketed series in equations (6V) and (6T) as convergent in the real world. Comparing that expression to

$$1 - x + x^2 - x^3 + x^4 - \ldots . x^n$$

which converges to $1/(1 + x)$ where $x < 1$*

we see that

$$\underset{0-E}{\triangle} V = \underset{0-1}{\triangle} V/(1 + (e/c))$$

or $$\underset{0-E}{\triangle} V = -\underset{0-1}{\triangle} T/(c + e) = -V_o \ (e-e')/(c + e)$$

and $$\underset{0-E}{\triangle} T = \underset{0-1}{\triangle} T/(1 + (e/c))$$

This equilibrium solution exists for all values of e and c, although it is an unstable equilibrium where $e \geq c$ in a hypothetical non-convergent situation. If a foresighted assessor administers tax shifts according to formula (7T) in a non-convergent system, full and immediate capitalization will establish equilibrium property values in one step and the adjustment process will stop. If the assessor fails to do this, we board the non-convergence roller coaster.

For all conceivable (i.e. positive) values of e and c, both tax and value changes from the initial period zero to equilibrium will be less severe than the initial impact changes from period zero to period one. Looking back to lines (7V) and (7T) we see that where the effective tax rate is one half of the capitalization rate, the changes from our starting point

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* E.P. Adams, Smithsonian Mathematical Formulae, Smithsonian Institute, 1922, p. 117.

to equilibrium are only two-thirds of the shifts to period one. If the effective tax rate were twice the capitalization rate, this figure would be one-third. We will return to these last formulae to express equilibrium values and taxes in terms of absolute levels rather than relative changes after considering an alternative scenario complementary to the iterative process.

The Steady State Path to Equilibrium

"Steady state"* adjustment proceeds in one step directly to equilibrium. While the iterative model of behavior supposes that assessors and markets act with no anticipation of value or further tax changes (except that we have invoked some anticipation to bring cases where $e \geq c$ into convergence), steady state demands accurate expectations based on perfect information. Here assessors pursue equalization by reassessing properties on the basis of equilibrium values under the new effective tax rate, and markets respond by capitalizing in accord with the assessors' expectations. Assessors can calculate equilibrium values from a knowledge of present property values, taxes, and cap rates using a derivation of equation (1) which we will restate as

$$V_o = \frac{R - T_o}{c} \qquad (1S$$

Return (R) is constant during equalization since we have assumed fixed housing budgets, no tax pass through for income properties, and a general ceteris paribus.

$$R = cV_o + T_o \qquad (2S$$

* This name and the following description are from Holland and Oldman, op. cit., Appendix B.

Equation (1) will hold at equilibrium also, but with new values and taxes

$$V_E = \frac{R - eV_E}{c} = \frac{cV_o + T_o}{c + e} \quad ($$

and

$$T_E = eV_E = \frac{e(cV_o + T_o)}{c + e} \quad ($$

This expresses equilibrium values and taxes in terms of our constant parameters and pre-revaluation values and taxes.

We can also arrive at line (3S) from our last formula for iterative process value change (8V):

$$\underset{o-E}{\triangle} V = - \underset{o-1}{\triangle} T/(c + e)$$

$$V_E - V_o = - (eV_o - T_o)/(c + e) \quad (9$$

$$(V_E - V_o)\ (c + e) = T_o - eV_o \quad (10$$

$$V_E(c + e) - cV_o = T_o \quad (11$$

$$V_E = \frac{cV_o + T_o}{c + e} \quad (12$$

Line (12V) is identical to (3S). Both iterative and steady state processes result in the same final values and taxes.

In fact, however, this end equivalence of iterative and steady state scenarios may never come about. Decisions and actions that we have defined as external to iterative adjustment are not so easily excluded from the real world. Questions of investment, maintenance, abandonment, and residence could have different answers in steady state and iterative disequilibrium environments. Where such differences are felt by population groups or property types supply and demand balances would be affected and new public policy could be demanded. When the last iteration comes to rest it might be in a place unlike the steady state world. In general, we prefer

the steady state path since it is administratively more efficient and reduces the duration and degree of private sector uncertainty and hardship. Information, expectation, and confidence will determine the choice between these two scenarios.

An Alternative Derivation

We might try to arrive at lines (8V) and (3S) by differentiating equation with respect to V and T, but we must remember that we are dealing with discrete finite changes, not infinitesimals. Simply differentiating equation (1) at our pre-change point, we would have:

$$dV = \frac{-dT}{c} \tag{2}$$

and since $T_o = e' V_o$

$$dV = \frac{-(V_o de + e' dV)}{c} \tag{3}$$

$$dV(1 + (e'/c)) = \frac{-V_o de}{c} \tag{4}$$

$$dV = \frac{-V_o de}{c + e'} \tag{5}$$

which is similar to our equation (8V) except that the denominator contains the old effective tax rate, e', rather than the new one, e. We have been led to this error by a correct calculus applied to an inappropriate situation.* Since we are concerned with discrete changes

$$\underset{o-E}{\triangle} V = \frac{-\underset{o-E}{\triangle} T}{c} \tag{6}$$

and with $T = eV$

$$\underset{o-E}{\triangle} T = T_E - T_o = eV_E - e' V_o \tag{7}$$

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* On this point, we differ with Bloom, Ladd and Yinger (op.cit.)

Adding and subtracting eV_o to the right side

$$\underset{o-E}{\triangle}T = eV_o + eV_E - e'V_o - eV_o \qquad (8$$

Gathering terms and factoring

$$\underset{o-E}{\triangle}T = e(V_E - V_o) + V_o(e-e') = e\underset{o-E}{\triangle}V + V_o \underset{o-E}{\triangle}e \qquad (9$$

Substituting (9) into (6) yields

$$\underset{o-E}{\triangle}V = \frac{-e\underset{o-E}{\triangle}V - V_o \underset{o-E}{\triangle}e}{c} \qquad (10$$

$$\underset{o-E}{\triangle}V(1 + (e/c)) = \frac{-V_o \underset{o-E}{\triangle}e}{c} \qquad (11$$

$$\underset{o-E}{\triangle}V = \frac{-V_o \underset{o-E}{\triangle}e}{c + e} \qquad (12$$

which is identical to our equation (8V).

Equilibrium Value Tax Base

If all properties capitalized tax changes into value changes to the same degree and with the same capitalization rate, then equalization of proo property tax rates with no change in the levy would leave the size of the tax base unchanged. Just as each dollar of tax increase for some property within a jurisdiction would be offset by a dollar of tax reduction for anoth property, so would each 1/c dollars of value loss be offset by 1/c dollars of value gain elsewhere. In this case neither the tax base nor the tax rate would differ under the two alternatives of current value and equilibriu value assessment. But if tax capitalization occurs differently among the properties in a jurisdiction, a constant levy does not assure a constant tax base.

Our calculations to illustrate equalization at equilibrium values and taxes presumed three different property tax capitalization responses. Personalty was assumed not to capitalize taxes at all, with its value appraised on a replacement cost minus depreciation basis. One, two, and three family homes were assigned a 10.4 percent capitalization rate to maintain a constant sum of periodic mortgage and tax payments. All other properties were given a twelve percent cap rate to accommodate investment return. Shifting tax burdens among these three sectors will change the tax base even where there is no net change in the aggregate levy. Our earlier formulae allow us to calculate equilibrium values, taxes, changes for properties and property classes when we are given initial values and taxes, tax capitalization rates, and a new effective tax rate. This new effective tax rate must exactly bill the equilibrium value tax base for the levy required.

Since the tax rate and market value tax base are interdependent, we have calculated them simultaneously using a series of successive approximations and the definition that the effective tax rate is equal to the tax levy divided by sum of taxable market values:

$$e = \frac{L}{V_{pp} + \sum_{i=1}^{n} \frac{R_i}{c_i + e}} \qquad (13)$$

where L = the property tax Levy
V_{pp} = the Value of personal property (assumed to be independent of property taxes)
n = the number of properties or property types
R,e, and c are Return, effective tax rate, and capitalization rate as before.

Inserting the pre-capitalization effective tax rate as "e" in the right side of the equation (13) we calculate a new "e". If these two values of "e" differ by more than a tenth of a percent, we repeat the procedure,

inserting the new "e" into the right side of the equation. Eventually (generally after about a half dozen repetitions) successive values of "e" came into close agreement. We can now use this approximation of the effective tax rate along with the other observed and assumed parameters to figure post-capitalization equilibrium values and taxes for individual properties or classes via our earlier formulae.

Expanding the Notation for Classification

Up to this point we have expressed our basic hypothetical tax and value relationships in the context of full market value assessments and a uniform tax rate for all jurisdiction properties with no property-specific exemptions But in 1978 Massachusetts adopted a property tax classification schedule that would tax each municipality's property at one nominal rate while assessing different classes of property at different set fractions of market value. The 1978 law also called for the tax exemption of a set amount of assessed value for each residential-class parcel. In 1979 this law was replaced by new property tax classification legislation that required full value assessme for all property but gave cities and towns a limited range of local option choice for setting different tax rates for the defined property classes. The new law also allowed the granting of a lump sum exemption for each residentia class assessment. The workings of these two classification plans are fully explained in Chapter Five of Volume I. Some additional notation will allow us to find equilibrium values and taxes for these situations within our established framework.

For the old classification plan (Chapter 580 of 1978) let us define:

t = the nominal tax rate applied to all property assessments

P_i = the proportionment factor (assessment/value ratio set by law) for property or property type "i".

B_i = the "Bonus" amount of assessed value specially exempted from taxation (for residential parcels).

Assessed values would be figured as $p_i V_i - B$ so classification tax bills would be

$$T_i = t\ (p_i V_i - B_i). \tag{14}$$

Equilibrium market values would be described by

$$V_{iE} = \frac{(R_i + tB_i)}{(c_i + p_i t)} \tag{15}$$

rather than by our earlier equations (3S) and (12V). In our last formula (tB_i) is the amount of taxes abated due to the special exemption and $(c_i + p_i t)$ is the ad valorem rate* by which tax and mortgage payments must be met for homeowner properties or by which profit demands and taxes must be met for income properties. To calculate the nominal tax rate that is consistent with the equilibrium value tax base we must change equation (13) to

$$t = \frac{L}{V_{pp} + \sum_{i=1}^{n} \frac{(R_i + tB_i)\ p_i}{c_i + p_i t} - B_i} \tag{16}$$

The bracketed expression being summed across "i" represents the tax base of assessed values for tax-capitalizing realty: market value multiplied

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* This is not quite the real ad valorem rate for properties receiving the exemption B_i but equation (15) still correctly shows equilibrium values since the exemption's effect is accounted for in the numerator.

by proportionment factor minus any exemptions. The value of personal property (V_{pp}) is assumed to be independent of property taxes and has a proportionment factor of one (p_i = 1.0 for personalty) and no exemptions (B_i = 0) under the old law.

For the new classification law (properly named Chapter 797 of 1979) we can make do with the same equations (14,15, and 16) but with the limitations that all properties are assessed at full market value (all p_i = 1) and that equilibrium value tax base and rate calculations must be performed for each class separately if they are to have different tax rates (t_i). The range of local option choice offered to cities and towns under this state law permits a decision to tax all properties at the same rate and with no property-specific exemptions. These are just the "no classification" ground rules we followed in earlier sections of this chapter. In this case, not only do all p_i = 1, but also all B_i = 0 and all t_i= e so equations (15) and (16) reduce back to (3S) and (13).

Expanding the Model for Reality

If our tax capitalization model has achieved its goal of simplicity, it may be through some loss of reality. In this concluding section on the topic, let us review a few of its major shortcomings and consider the direction and magnitudes of difference between our illustrations and more sophisticated possible estimates.

In stipulating that tax changes are fully capitalized into income properties' values, we excluded the possibility of tax pass-through to tenants. In fact, many rental leases contain tax escalation clauses that

require tenants to absorb all or most of any property tax increase. If pass-through is complete then a tax rise would leave net operating income unchanged and value could remain unaffected also. If a property is less than fully occupied, however, net operating income could be reduced by the amount of tax increase attributable to the vacant space. The risk element of discounted cost for possible future vacancies would be greater also. Furthermore, in sub-markets experiencing slack demand, full pass-through may result in occupancy loss for properties receiving relatively greater tax increases and occupancy gain for the relatively less tax impacted competition. In general, value losses from tax increases would be lessened though perhaps not completely avoided where tenants bear additional tax burden. Investment properties enjoying tax cuts are likely to enjoy capital gains as before since "tax de-escalation" clauses are uncommon and owners would probably not reduce rents unless such reduction would cut vacancies and increase income. In sum, aggregate rental property value gains would be greater and losses less in the real world where tax increases but not reductions may be passed on to renters.

If we relax the condition that commercial and residential renters and home owners have absolutely constrained budgets, we could see relative rather than absolute tax changes capitalized into property values. We must ask but cannot answer the question: relative to what? What ownership cost increases will property sub-market price bidders accept without changing bids and what degree of substitution prevails among sub-markets? If people, businesses, and capital are perfectly mobile then relative tax changes would be measured

against a broad (and presumably fairly stable) standard and there would be little difference between the absolute and relative hypotheses. If mobility and substitution are very limited, a property tax increase could result in a substantial value gain if other sub-market properties experience much larger tax increases and only relative changes are capitalized. Total sub-market value might be little or not at all affected if the average tax change is acceptable to bidders with no change in price bids. If we wish to establish a standard by which to measure relative tax changes in the somewhat limited substitution case, we must first establish a schedule by which changing ownership costs translate into willingness to substitute. If this substitution schedule places limits on the amounts or degrees by which ownership costs may fall or rise before demand substitution in or out affects prices, only changes beyond those levels may be capitalized. The willingness to accept some absolute tax change without changing price bids would moderate resultant value changes.

While we have specified that tax changes are fully capitalized, there are at least two reasons for believing that only partial capitalization will occur. Firstly, purchasers may have anticipated equalization and discounted what are perceived as temporary tax advantages or disadvantages. In this case a portion of the capitalization that we expect to see now would have already taken place and only tax changes in excess of the probability equivalent of an expected amount would be capitalized. Secondly, income tax deductability of property tax payments relieves taxpayers of some portion of the burden up to their marginal tax rate. A homeowner in the forty percent marginal income tax bracket already itemizing deductions would pay only sixty percent of any

property tax boost, the remainder being reimbursable as a federal tax subsidy. If prospective buyers for this home are in similar tax brackets, only sixty percent of the tax change might be capitalized. Both of these factors--anticipation and income tax deductibility--will vary substantially among submarkets, being stronger where taxable income and awareness of likely future tax changes are greater. The aggregate effect would be to reduce the magnitude of value changes envisioned under full capitalization. Still, if only a common fraction (F) of both present levels and subsequent changes in property tax burdens are capitalized, value changes would not be reduced to that fraction (F) of the change that we have illustrated under the full capitalization assumption. To show this, let us rewrite equation (2S) as

$$R = cV_o + FT_o \tag{17}$$

so

$$V_o = \frac{R - FT_o}{c} \tag{18}$$

and

$$V_E = \frac{R - FeV_E}{c} = \frac{cV_o + FT_o}{c + Fe} \tag{19}$$

Capitalized value change at equilibrium will therefore be

$$\underset{o-E}{\triangle} V = V_E - V_o = \frac{cV_o + FT_o - V_o(c+Fe)}{c+Fe} = \frac{(T_o - eV_o)F}{c+Fe} = \frac{-F \underset{o-1}{\triangle} T}{c+Fe} \tag{20}$$

The partial capitalization result of equation (20) differs from full capitalization in line (8V) by the presence of the capitalization fraction (F) in <u>both</u> numerator and denominator. The value change indicated by (20) is not simply the value change of (8V) times "F", but depends also on the magnitudes of "c" and "e". Consider these two examples: If F=.6, c=.105,

and e = .07 then formula (20) prescribes a value change of - $\underset{o-1}{\triangle} T^*$ times 4.082 under partial capitalization while (8V) calls for a change of - $\underset{o-1}{\triangle} T$ times 5.714 with full capitalization. The ratio of partial to full capitalization responses is .714 rather than the .6 magnitude of "F". If e = .03 instead of .07 then the partial capitalization value response is - $\underset{o-1}{\hat{\triangle}} T$ times 4.878 and the full capitalization effect is - $\underset{o-1}{\triangle}$ times 7.407 so that .659 is the ratio of partial to full capitalization value changes. If we have overstated value responses by modeling full rather than partial capitalization of both tax levels and changes, the degree of overstatement is less than the degree of tax and change not capitalized.

A final point that we will consider here is the issue of determining actual tax capitalization rates. Is there more to the cap rate than just the opportunity cost of capital? How should we specify the cost of capital? Capitalization should be worked upon the discounted present value of the future stream of income or housing services. It might be argued that we should explicitly include in our cap rate a factor reflecting expected futu rates of change in income or the cost of housing. But if these expectations have influenced the current values (V_o) from which we derived Return (R) they are already implicitly accounted for. Surely all income properties cannot be expected to share one singular cap rate. Differences in property lifetimes and the "quality"** of net operating income might lead to differen capitalization rates. We have neither the purpose nor the resources to

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* Of course our use of $\underset{o-1}{\triangle} T$ does not require adoption of the iterativ metaphor. It is simply $eV_o - T_o$.

** The safety/risk factors of demand strength and net/gross income ratio can affect the present value of a forecasted income flow.

determine "real" cap rates and can only hope that our "ball park" parameters are fairly appropriate for dealing with our aggregates. If housing budgets are not absolutely fixed, it may be more appropriate to capitalize taxes on homeowner properties with mortgage interest rates rather than with constant payment amortization rates as we have done. The 10.4 percent cap rate employed in our illustrations is the annual percent constant rate that will repay interest and principal on an 8.5 percent mortgage over twenty years. Adding this constant payment rate to the effective tax rate is a bit like adding apples and oranges since the mortgage will be paid up after twenty years while the taxes will follow us to the grave. One advantage of constant payment rates is that they tend to be more stable than interest rates. As interest rates rise, repayment schedules are often lengthened so that constant payment rates increase less rapidly. The more direct connection between household budgets and constant rates is appealing also. Nonetheless, if interest rates rather than the higher constant payment rates are how the world works, we will have understated homeowner value responses to tax changes.

To summarize the issues we have just considered: Failure to account for tax pass-through to the tenants of income properties may have led us to understate aggregate value gains and overstate losses in these sectors. If relative rather than absolute tax changes are capitalized then value changes would, in general, be more moderate than our simple model has illustrated. If existing tax levels are fully capitalized, but only a fraction (F) of changes are capitalized then only that fraction (F) of value changes we have indicated would occur. If only a fraction (F) of both present levels and

changes in taxes are capitalized, we will have overstated value responses by somewhat less than the degree to which taxes are not capitalized (less than 1-F). If our cap rates are too high, our illustrated value responses are too small and vice versa. If mortgage interest rates are more appropriate than constant payment amortization rates for homeowner property capitalization, then we have overstated the cap rate and understated value effects. Some of the possible modifications to our simple capitalization model would pul in opposite directions and tend to cancel one another out. For instance, if equalization will result in a three percent effective tax rate for some properties then their value changes will be the same under the specification of full capitalization and a 10.4 percent mortgage amortization cap rate or under the supposition of 81 percent partial capitalization of tax levels and changes at the corresponding 8.5 percent mortgage interest rate of capitalization.

While this discusion of alternative specifications for modeling tax capitalization is not complete, we hope to have touched upon some of the more important points. We cannot now resolve even those questions we have raised, and will be satisfied if readers are prepared to draw their own conclusions based on the effects illustrated by our simple model. We feel that the limitations of this model may be no more severe than the limitations of our data.

Appendix III-A

MEMORANDUM

TO: Alex Ganz

FROM: John Avault

DATE: August 20, 1979

SUBJECT: Update of Residential Property Market Value Index through 1975

The following tables update through 1975 the Property Value Index series for Boston and (16 old) Planning Districts that appeared in Research publication #34, Residential Property Market Values (1973). Trends for assessed values are also shown. The news is that Boston's values have been quite stagnant between 1973 and 1975 despite a high rate of general inflation (the consumer price index for Boston rose 20.3 percent over these years).

BOSTON
AVERAGE

YEAR	SALES	ASSESS
1955	1.000	1.000
1956	1.048	1.004
1957	1.059	1.014
1958	1.103	1.031
1959	1.203	1.000
1960	1.188	1.004
1961	1.248	1.021
1962	1.261	1.006
1963	1.365	1.013
1964	1.430	1.026
1965	1.567	1.030
1966	1.558	1.028
1967	1.650	1.018
1968	1.704	1.039
1969	1.819	1.041
1970	2.024	1.037
1971	2.025	1.069
1972	2.280	1.063
1973	2.468	1.085
1974	2.495	1.120
1975	2.487	1.140

Individual resale observations since 1975 suggest that we have more than made up for this slow period in the last few years, but documentation of recent strong growth must wait upon the availability of more current sales data.

Following the tables of Market Value and Assessed Value Index series are supplemental tables that describe the Planning District samples in terms of size, composition by type, average prices, etc. Finally, two additional tables show the number and percent of dwelling units over time in Boston's component districts. These percents were used as weights in constructing the Boston City Index from the several Planning District series. Graphs of the Market Value Index for Planning Districts will be available in Research next week.

/c
attachment

Market Value INDEX

by Planning District

YEAR	1	2	3	4
1955	1.0000	1.0000	1.0000	1.0000
1956	1.0756	.9273	.9725	.8393
1957	1.0640	.8077	1.0458	1.3716
1958	1.1448	1.1695	1.1402	1.2194
1959	1.1433	1.1829	1.1815	1.5024
1960	1.1086	1.0258	1.1777	1.4061
1961	1.3743	1.1133	1.3190	1.6654
1962	1.2349	1.2779	1.1988	1.8161
1963	1.3827	1.1872	1.4361	1.4069
1964	1.5736	1.2995	1.3871	1.4899
1965	1.6603	1.5323	1.3998	2.0114
1966	1.6111	1.9667	1.5570	1.7637
1967	1.6006	1.8796	1.5983	2.5519
1968	1.8700	1.6398	1.8601	2.5334
1969	1.7647	2.3694	1.8913	2.2509
1970	2.1883	3.1143	2.0388	3.7503
1971	2.4503	2.7363	2.1964	2.6126
1972	2.7960	3.7194	2.5577	4.3732
1973	3.1116	3.8162	2.8999	4.6425
1974	3.3528	4.7489	3.2190	4.0725
1975	3.2572	5.1303	3.1736	4.3375

YEAR	5	6	7	8
1955	1.0000	1.0000	1.0000	1.0000
1956	1.1432	.8717	.9345	1.1496
1957	1.1962	.6406	.8577	1.1956
1958	1.1866	.7624	.8541	1.2148
1959	1.4575	.8468	1.1355	1.2911
1960	1.5156	.7899	1.1787	1.3045
1961	1.5846	.8399	1.1630	1.3398
1962	1.8133	.6786	1.1810	1.3766
1963	1.9551	.7616	1.5697	1.5241
1964	2.2701	.8894	1.6083	1.5623
1965	2.3403	1.2255	1.9567	1.7022
1966	2.3924	1.4316	1.7532	1.6727
1967	2.6358	1.5108	2.0196	1.7023
1968	2.7975	1.7416	1.7730	1.8487
1969	3.0215	2.1171	1.8998	2.0250
1970	3.3826	2.5678	2.2210	2.2518
1971	3.1257	2.3370	2.9090	2.2700
1972	3.3107	3.0855	2.7441	2.5084
1973	4.0054	3.6570	2.6090	2.7353
1974	3.4787	3.7871	2.5275	2.8905
1975	3.7801	3.5215	2.6569	2.9312

Market Value INDEX

by Planning District

9	10	11	12
1.0000	1.0000	1.0000	1.0000
1.1079	1.1993	.9383	1.0405
1.1592	1.1000	1.1340	1.0994
1.0979	1.2246	1.1593	1.1355
1.2512	1.3073	1.0594	1.2520
1.0887	1.2368	1.2896	1.2016
1.2480	1.1213	1.1942	1.2508
1.2912	1.2567	1.2528	1.3334
1.4980	1.2065	1.3993	1.3162
1.3768	1.2985	1.3524	1.5179
1.3987	1.3512	1.4457	1.5806
1.4409	1.2158	1.4048	1.5077
1.4297	1.3791	1.4149	1.5924
1.5763	1.3295	1.3690	1.5152
1.4896	1.5302	1.4151	1.7166
1.7214	1.5123	1.2943	1.7831
1.6549	1.4792	1.4492	1.7805
1.6894	1.6233	1.5326	1.9532
1.9926	1.5685	1.5403	2.1100
1.9085	1.5380	1.6135	2.1773
1.8074	1.5115	1.4798	2.0989

13	14	15	16
1.0000	1.0000	1.0000	1.0000
1.0594	1.0746	1.1569	1.0541
1.1358	1.1589	.9805	.9851
1.1748	1.1294	.9855	1.0404
1.2047	1.2415	1.0534	1.3613
1.1661	1.3288	1.0931	1.1334
1.2943	1.3406	.9770	1.6357
1.2538	1.3854	1.0304	1.1298
1.4090	1.4726	1.1292	1.2855
1.4441	1.4368	1.1557	1.3768
1.4849	1.5877	1.2669	1.4560
1.5344	1.6868	1.2107	1.4092
1.5482	1.5797	1.2651	1.3369
1.5920	1.6432	1.2782	1.3406
1.7766	1.7793	1.2792	1.5228
1.8885	1.9627	1.3267	1.0926
1.8653	1.9253	1.2753	1.4921
2.0291	2.0530	1.2970	1.5622
2.1698	2.1978	1.3731	1.5795
2.2902	2.2932	1.3659	1.6410
2.3029	2.2151	1.4254	1.3710

Assessed Value INDEX

by Planning District

YEAR	1	2	3	4
1955	1.0000	1.0000	1.0000	1.0000
1956	1.0168	.9032	1.0627	.9699
1957	1.0055	1.0047	1.0733	.8579
1958	1.0062	.9695	1.0041	1.1215
1959	1.0241	.9758	1.0422	1.0234
1960	1.0089	1.0426	1.0432	.9551
1961	1.0555	1.0494	1.0357	.9891
1962	1.0109	.9927	1.0461	.9435
1963	1.0104	.9888	1.0657	.8992
1964	1.0152	.9960	1.0531	1.1202
1965	1.0428	1.0226	1.0330	1.0543
1966	1.0235	1.0116	1.0883	1.1226
1967	.9825	.9694	1.0194	1.0896
1968	.9884	1.0105	1.0239	1.0826
1969	1.0463	.9941	1.1544	1.0414
1970	1.0308	.9533	1.0300	1.1557
1971	1.0478	.9976	1.0838	1.2291
1972	1.0423	1.0179	1.1025	1.1895
1973	1.0777	1.0528	1.1061	1.2615
1974	1.1152	1.0438	1.1260	1.4590
1975	1.0845	.9944	1.1934	1.2907

YEAR	5	6	7	8
1955	1.0000	1.0000	1.0000	1.0000
1956	1.0157	1.0724	.9171	1.0448
1957	1.0537	1.0615	1.0008	1.0157
1958	1.1237	1.1756	.9974	1.0391
1959	1.0310	.7270	.9924	1.0650
1960	1.0719	1.0308	1.0256	.9917
1961	1.1292	1.0644	.9493	1.0229
1962	1.1149	.9906	.9823	1.0282
1963	1.1038	1.0154	1.0023	1.0356
1964	1.1656	1.0287	1.0819	1.0152
1965	1.1752	.9995	1.0805	1.0095
1966	1.3011	.9769	.9808	1.0344
1967	1.2618	.9650	.9017	1.0374
1968	1.2434	1.0559	1.2175	1.0046
1969	1.2702	1.0906	1.1539	1.0367
1970	1.2275	1.1446	1.0960	1.0387
1971	1.3728	1.0803	1.3776	1.0369
1972	1.3585	1.1711	1.3688	.9767
1973	1.4799	1.2211	1.3969	1.0451
1974	1.4622	1.4654	1.3404	1.1534
1975	1.5049	1.5490	1.8036	1.1206

Assessed Value INDEX

by Planning District

9	10	11	12
1.0000	1.0000	1.0000	1.0000
.9874	.9847	1.0398	.9979
.9558	1.0625	1.0258	.9862
.9887	1.0040	1.0482	.9872
.9550	1.0860	1.0598	.9941
.9918	.9189	1.0468	.9914
.9520	1.0279	1.0236	.9667
.9615	1.0038	1.0048	.9908
.9720	.9602	1.0549	.9916
.9681	.9683	1.0358	.9951
.9777	.9774	1.0608	1.0020
.9366	.9797	1.0325	.9829
.9535	.9907	1.0446	.9799
.9764	.9466	1.0157	1.0213
.9695	.9128	.9904	1.0003
.9732	.9017	1.0029	1.0143
.9564	.8948	1.0372	1.0020
.9664	.9001	1.0215	1.0367
.9797	.8784	1.0137	1.0123
.9716	.9404	1.0309	.9986
.9792	.8575	1.0480	1.0139

13	14	15	16
1.0000	1.0000	1.0000	1.0000
.9853	.9771	1.0368	.9116
1.0210	.9123	1.0363	.9641
.9692	.9851	.9991	.9751
.9982	.9861	1.0108	.9520
.9696	1.0068	1.0379	1.0000
1.0107	.9927	1.0361	.9867
.9890	.9932	1.0196	.9756
1.0126	1.0126	1.0556	.9948
1.0030	.9903	1.0633	.9577
1.0411	.9932	1.0961	.9430
.9986	1.0012	1.0718	.9090
1.0727	1.0129	1.0541	.9155
1.0401	1.0170	1.0647	1.0301
1.0479	1.0132	1.0769	.9359
1.0695	1.0142	1.0698	.9830
1.0555	1.0340	1.0882	.9606
1.0352	1.0269	1.0556	.9512
1.0437	1.0332	1.0621	.9355
1.0579	1.0059	1.0512	.9119
1.0613	1.0019	1.0654	.9451

PLANNING DISTRICT 1

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4637	0.1419	17	17	0	3.9771
1956	0.4889	0.2095	19	18	1	5.3305
1957	0.4849	0.1634	11	9	2	2.8532
1958	0.4858	0.2624	29	26	3	8.7702
1959	0.5102	0.3821	20	18	2	7.9796
1960	0.4644	0.2285	13	13	0	3.4308
1961	0.4269	0.2062	18	12	6	4.0035
1962	0.4710	0.2026	19	14	5	4.9528
1963	0.4690	0.2404	28	21	7	7.7204
1964	0.3858	0.1923	29	15	14	5.3505
1965	0.4351	0.1629	27	19	8	5.8011
1966	0.3862	0.1569	34	17	17	5.8830
1967	0.4294	0.2854	22	14	8	5.7678
1968	0.3111	0.1330	31	12	19	3.5310
1969	0.3611	0.2036	46	19	27	7.8625
1970	0.3555	0.3209	39	16	23	8.8419
1971	0.2875	0.0902	37	18	19	3.3517
1972	0.2451	0.1017	39	18	21	2.7366
1973	0.2233	0.0888	56	9	47	3.2259
1974	0.2147	0.0807	46	3	43	2.4132
1975	0.2113	0.0921	36	0	36	1.9039

NUMBER OF OBSERVATIONS EQUALS 308

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNIT
1955	0.00(0)	10.50(5)	3.53(11)	1.50(1)	0.00(0)	4.09(17)
1956	0.00(0)	9.00(6)	3.50(12)	2.30(1)	0.00(0)	4.17(19)
1957	0.00(0)	12.75(2)	3.65(9)	0.00(0)	0.00(0)	4.38(11)
1958	0.00(0)	10.21(7)	4.14(18)	1.39(4)	0.00(0)	3.74(29)
1959	0.00(0)	15.36(7)	3.66(12)	1.50(1)	0.00(0)	5.27(20)
1960	0.00(0)	9.50(3)	3.30(10)	0.00(0)	0.00(0)	3.96(13)
1961	0.00(0)	10.00(2)	4.74(13)	1.67(3)	0.00(0)	3.86(18)
1962	0.00(0)	6.75(4)	3.92(11)	1.71(4)	0.00(0)	3.21(19)
1963	0.00(0)	12.67(6)	3.30(20)	3.17(2)	0.00(0)	4.01(28)
1964	0.00(0)	12.36(7)	4.85(20)	2.71(2)	0.00(0)	5.22(29)
1965	0.00(0)	0.00(0)	3.97(27)	0.00(0)	0.00(0)	3.97(27)
1966	0.00(0)	12.55(4)	4.86(27)	2.75(3)	0.00(0)	4.74(34)
1967	0.00(0)	12.57(7)	4.29(14)	0.83(1)	0.00(0)	5.01(22)
1968	0.00(0)	18.55(10)	5.60(21)	0.00(0)	0.00(0)	7.62(31)
1969	0.00(0)	16.50(10)	4.65(35)	3.20(1)	0.00(0)	5.63(46)
1970	0.00(0)	12.75(8)	5.69(29)	3.92(2)	0.00(0)	6.07(39)
1971	0.00(0)	16.30(3)	5.59(31)	3.65(3)	0.00(0)	5.53(37)
1972	0.00(0)	19.36(7)	6.14(30)	3.80(2)	0.00(0)	6.74(39)
1973	0.00(0)	21.11(9)	7.55(44)	4.71(3)	0.00(0)	7.97(56)
1974	0.00(0)	22.19(8)	8.75(34)	6.41(4)	0.00(0)	9.21(46)
1975	0.00(0)	26.63(7)	8.06(26)	5.47(3)	0.00(0)	8.93(36)

PLANNING DISTRICT 2

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.6206	0.1698	13	13	0	5.3526
1956	0.4787	0.1151	7	7	0	1.6837
1957	0.5280	0.2015	10	9	1	3.1533
1958	0.5691	0.1598	9	7	2	3.1193
1959	0.4777	0.4000	10	8	2	3.7216
1960	0.4883	0.2129	9	8	1	2.5086
1961	0.5298	0.1773	16	7	9	4.9628
1962	0.5085	0.2603	17	10	7	5.4798
1963	0.4947	0.3168	8	8	0	2.6600
1964	0.4710	0.1552	20	12	8	4.8953
1965	0.3824	0.1662	14	8	6	2.4061
1966	0.3252	0.2184	18	11	7	2.7145
1967	0.3241	0.2020	22	11	11	3.1681
1968	0.2892	0.1112	21	10	11	2.0036
1969	0.2720	0.1330	17	4	13	1.5408
1970	0.2182	0.0708	20	9	11	1.0472
1971	0.2656	0.1710	24	12	12	2.3662
1972	0.1619	0.0856	9	4	5	0.2946
1973	0.1664	0.0639	22	3	19	0.6951
1974	0.1508	0.1050	17	0	17	0.5628
1975	0.1418	0.0655	19	0	19	0.4592

NUMBER OF OBSERVATIONS EQUALS 161

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	4.70(5)	2.15(8)	0.00(0)	0.00(0)	2.66(13)
1956	0.00(0)	4.90(5)	2.87(2)	0.00(0)	0.00(0)	4.00(7)
1957	0.00(0)	3.80(8)	1.20(2)	0.00(0)	0.00(0)	2.80(10)
1958	0.00(0)	10.33(3)	1.69(6)	0.00(0)	0.00(0)	3.21(9)
1959	0.00(0)	4.48(5)	2.42(5)	0.00(0)	0.00(0)	2.99(10)
1960	0.00(0)	7.43(3)	1 94(6)	0.00(0)	0.00(0)	2.81(9)
1961	0.00(0)	5.29(7)	2.22(9)	0.00(0)	0.00(0)	2.93(16)
1962	8.00(1)	8.30(5)	2.40(10)	1.17(1)	0.00(0)	2.63(17)
1963	11.00(1)	9.80(5)	2.10(2)	0.00(0)	0.00(0)	4.70(8)
1964	11.00(1)	4.83(3)	3.06(15)	1.75(1)	0.00(0)	2.92(20)
1965	0.00(0)	8.00(2)	3.62(12)	0.00(0)	0.00(0)	3.90(14)
1966	32.00(1)	12.24(8)	3.19(7)	1.42(2)	0.00(0)	4.34(18)
1967	0.00(0)	12.53(9)	4.37(11)	2.50(2)	0.00(0)	5.46(22)
1968	0.00(0)	8.47(11)	4.48(10)	0.00(0)	0.00(0)	5.67(21)
1969	0.00(0)	9.67(6)	4.89(10)	3.75(1)	0.00(0)	5.46(17)
1970	16.50(1)	20.28(9)	5.61(10)	0.00(0)	0.00(0)	8.86(20)
1971	39.50(1)	20.83(9)	5.72(14)	0.00(0)	0.00(0)	8.66(24)
1972	0.00(0)	29.83(3)	7.53(6)	0.00(0)	0.00(0)	11.05(9)
1973	0.00(0)	23.75(6)	8.83(16)	0.00(0)	0.00(0)	10.78(22)
1974	0.00(0)	32.43(7)	10.49(9)	2.33(1)	0.00(0)	13.48(17)
1975	0.00(0)	25.22(9)	10.05(10)	0.00(0)	0.00(0)	14.06(19)

PLANNING DISTRICT 3

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4848	0.2153	20	20	0	5.5812
1956	0.5830	0.2320	12	11	1	4.6704
1957	0.4352	0.1552	17	16	1	3.6057
1958	0.4144	0.1492	18	14	4	3.4690
1959	0.4409	0.1737	25	20	5	5.5838
1960	0.4512	0.1969	13	10	3	3.1123
1961	0.4123	0.1282	31	26	5	5.7634
1962	0.4851	0.2266	42	32	10	11.9869
1963	0.3989	0.1553	21	14	7	3.8246
1964	0.4444	0.2030	37	25	12	8.7889
1965	0.4523	0.1769	30	15	15	7.0441
1966	0.3339	0.0996	33	19	14	3.9967
1967	0.4360	0.2796	35	23	12	9.3102
1968	0.3608	0.2450	32	13	19	6.0274
1969	0.3910	0.2247	40	20	20	8.0841
1970	0.2750	0.1573	32	11	21	3.1871
1971	0.2971	0.1632	44	18	26	5.0303
1972	0.2026	0.0711	32	11	21	1.4695
1973	0.2211	0.1366	65	7	58	4.3723
1974	0.2119	0.1107	33	0	33	1.8738
1975	0.2444	0.1566	38	0	38	3.1765

NUMBER OF OBSERVATIONS EQUALS 325

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNIT
1955	0.00(0)	6.29(7)	2.34(13)	0.00(0)	0.00(0)	3.01(20)
1956	0.00(0)	6.67(3)	3.52(9)	0.00(0)	0.00(0)	3.87(12)
1957	0.00(0)	7.50(5)	3.68(11)	0.83(1)	0.00(0)	3.73(17)
1958	0.00(0)	6.25(6)	3.03(11)	1.75(1)	0.00(0)	3.31(18)
1959	0.00(0)	5.78(9)	3.06(15)	1.00(1)	0.00(0)	3.29(25)
1960	0.00(0)	9.17(3)	3.71(9)	1.75(1)	0.00(0)	3.73(13)
1961	0.00(0)	6.31(8)	3.95(23)	0.00(0)	0.00(0)	4.23(31)
1962	13.50(1)	7.15(13)	2.65(26)	1.12(2)	0.00(0)	3.07(42)
1963	0.00(0)	11.53(9)	3.95(10)	2.39(2)	0.00(0)	4.98(21)
1964	0.00(0)	8.27(8)	3.20(27)	0.83(2)	0.00(0)	3.25(37)
1965	0.00(0)	12.50(6)	2.62(20)	1.00(4)	0.00(0)	2.74(30)
1966	18.00(1)	11.70(8)	3.98(23)	2.33(1)	0.00(0)	4.60(33)
1967	0.00(0)	10.10(10)	2.63(24)	1.00(1)	0.00(0)	3.40(35)
1968	0.00(0)	8.75(10)	5.80(20)	1.25(2)	0.00(0)	5.47(32)
1969	0.00(0)	14.61(9)	4.17(28)	1.36(3)	0.00(0)	4.50(40)
1970	0.00(0)	14.77(12)	4.65(20)	0.00(0)	0.00(0)	6.46(32)
1971	0.00(0)	16.37(16)	5.60(25)	2.61(3)	0.00(0)	6.76(44)
1972	0.00(0)	21.07(7)	7.13(23)	3.53(2)	0.00(0)	7.88(32)
1973	0.00(0)	23.27(16)	7.10(43)	4.01(6)	0.00(0)	7.99(65)
1974	0.00(0)	17.48(10)	7.13(22)	8.37(1)	0.00(0)	8.62(33)
1975	0.00(0)	27.58(5)	7.15(32)	5.83(1)	0.00(0)	8.10(38)

PLANNING DISTRICT 4

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.6998	0.0885	4	4	0	1.9822
1956	0.8930	0.0904	3	3	0	2.4087
1957	0.4617	0.0644	7	7	0	1.5170
1958	0.6089	0.1257	5	5	0	1.9169
1959	0.6029	0.2650	4	2	2	1.6645
1960	0.4240	0.0926	5	4	1	0.9332
1961	0.4382	0.1106	9	3	6	1.8259
1962	0.4077	0.1645	11	7	4	2.0989
1963	0.4510	0.1623	5	3	2	1.1225
1964	0.8500	0.0000	1	1	0	0.7225
1965	0.3611	0.1467	14	6	8	2.1049
1966	0.4507	0.2080	6	5	1	1.4349
1967	0.3274	0.1213	10	3	7	1.2042
1968	0.3327	0.1254	11	6	5	1.3747
1969	0.3082	0.1388	8	5	3	0.8947
1970	0.2602	0.0921	14	7	7	1.0582
1971	0.3590	0.1494	5	1	4	0.7336
1972	0.2499	0.0579	7	2	5	0.4573
1973	0.2235	0.0413	10	2	8	0.5148
1974	0.2667	0.0691	9	1	8	0.6783
1975	0.2393	0.0903	6	0	6	0.3843

NUMBER OF OBSERVATIONS EQUALS 77

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	7.00(1)	3.43(2)	1.06(1)	0.00(0)	2.47(4)
1956	0.00(0)	6.50(1)	0.00(0)	2 04(2)	0.00(0)	2.36(3)
1957	0.00(0)	17.72(5)	3.83(1)	2.39(1)	0.00(0)	7.15(7)
1958	0.00(0)	14.25(2)	3.58(3)	0.00(0)	0.00(0)	5.22(5)
1959	0.00(0)	17.25(2)	3.10(2)	0.00(0)	0.00(0)	5.93(4)
1960	0.00(0)	35.20(3)	5.33(1)	6.96(1)	0.00(0)	10.95(5)
1961	0.00(0)	20.12(4)	3.91(4)	8.21(1)	0.00(0)	7.70(9)
1962	0.00(0)	52.25(4)	8.12(6)	4.17(1)	0.00(0)	13.39(11)
1963	0.00(0)	14.17(3)	0.00(0)	3.75(2)	0.00(0)	5.83(5)
1964	0.00(0)	10.00(1)	0.00(0)	0.00(0)	0.00(0)	10.00(1)
1965	0.00(0)	25.33(6)	6.83(7)	4.57(1)	0.00(0)	9.41(14)
1966	20.00(1)	35.00(1)	5.18(3)	1.50(1)	0.00(0)	4.95(6)
1967	0.00(0)	20.00(1)	7.85(9)	0.00(0)	0.00(0)	8.23(10)
1968	0.00(0)	29.00(4)	8.00(3)	5.36(4)	0.00(0)	8.23(11)
1969	0.00(0)	27.40(5)	8.29(2)	2.00(1)	0.00(0)	8.33(8)
1970	29.50(1)	43.86(7)	13.43(2)	5.54(4)	0.00(0)	12.77(14)
1971	23.90(1)	51.00(1)	14.11(3)	0.00(0)	0.00(0)	13.46(5)
1972	0.00(0)	19.33(3)	16.36(2)	7.31(2)	0.00(0)	11.13(7)
1973	39.50(1)	14.50(1)	16.76(5)	7.64(2)	43.80(1)	12.89(10)
1974	0.00(0)	43.75(4)	9.00(3)	4.80(1)	55.20(1)	12.94(9)
1975	0.00(0)	22.00(1)	15.36(2)	4.44(1)	58.40(2)	15.07(6)

PLANNING DISTRICT 5

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.6984	0.2257	17	17	0	9.1077
1956	0.6377	0.1719	20	15	5	8.6950
1957	0.5674	0.1620	22	18	4	7.6340
1958	0.5983	0.1388	21	16	5	7.9026
1959	0.5507	0.1706	29	19	10	9.6083
1960	0.4862	0.1596	20	16	4	5.2115
1961	0.4537	0.1308	23	12	11	5.1116
1962	0.4350	0.1318	35	20	15	7.2123
1963	0.4101	0.1133	31	14	17	5.5976
1964	0.3337	0.1025	18	12	6	2.1829
1965	0.3659	0.1076	28	20	8	4.0620
1966	0.4209	0.1816	25	17	8	5.2205
1967	0.3309	0.0959	36	23	13	4.2624
1968	0.3023	0.0974	33	20	13	3.3194
1969	0.2903	0.1050	34	19	15	3.2298
1970	0.2360	0.0579	24	15	9	1.4141
1971	0.2859	0.0947	33	16	17	2.9850
1972	0.2684	0.0735	32	19	13	2.4731
1973	0.2544	0.0792	71	11	60	5.0351
1974	0.2689	0.0791	48	10	38	3.7640
1975	0.2561	0.0921	58	0	58	4.2883

NUMBER OF OBSERVATIONS EQUALS 329

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES SUNITS/
1955	20.67(3)	27.44(9)	7.50(1)	4.17(4)	0.00(0)	7.81(17)
1956	24.23(3)	27.85(12)	6.07(2)	6.90(3)	0.00(0)	10.48(20)
1957	26.30(2)	33.18(14)	6.08(2)	5.34(4)	0.00(0)	11.59(22)
1958	23.62(4)	30.65(11)	8.07(2)	5.98(4)	0.00(0)	8.70(21)
1959	26.70(3)	31.42(10)	6.14(7)	6.59(9)	0.00(0)	8.09(29)
1960	20.05(4)	42.30(10)	13.00(1)	7.23(5)	0.00(0)	11.35(20)
1961	28.50(7)	41.25(10)	12.25(3)	6.40(3)	0.00(0)	10.92(23)
1962	28.50(3)	43.95(13)	15.73(7)	8.51(12)	0.00(0)	12.28(35)
1963	44.75(6)	48.62(8)	11.26(10)	8.63(7)	0.00(0)	11.62(31)
1964	39.50(1)	63.00(5)	13.76(6)	7.73(6)	0.00(0)	13.08(18)
1965	27.00(1)	60.42(12)	15.28(5)	6.89(10)	0.00(0)	13.67(28)
1966	29.33(6)	50.46(7)	16.35(4)	10.67(8)	0.00(0)	12.37(25)
1967	68.10(6)	68.12(13)	12.24(6)	11.46(11)	0.00(0)	16.87(36)
1968	41.37(4)	65.40(15)	18.08(5)	9.36(9)	0.00(0)	16.72(33)
1969	79.75(2)	76.17(16)	22.65(4)	13.32(12)	0.00(0)	21.44(34)
1970	80.67(3)	93.57(13)	17.30(3)	19.07(4)	32.00(1)	32.80(24)
1971	35.75(2)	77.02(13)	21.46(7)	16.02(8)	48.83(3)	23.61(33)
1972	50.00(1)	87.21(7)	24.00(5)	11.56(9)	46.60(10)	21.39(32)
1973	58.50(9)	90.48(23)	21.04(14)	14.47(23)	29.70(2)	20.46(71)
1974	62.00(1)	98.32(18)	27.20(7)	14.27(14)	51.01(8)	27.36(48)
1975	66.00(1)	88.23(19)	22.57(5)	12.04(9)	53.32(24)	28.93(58)

PLANNING DISTRICT 6

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SO. A/S
1955	0.6107	0.1338	4	4	0	1.5455
1956	0.8104	0.1216	5	5	0	3.3432
1957	0.7183	0.0704	7	6	1	3.6411
1958	1.3333	0.0000	1	1	0	1.7778
1959	0.5000	0.0000	1	1	0	0.2500
1960	0.6556	0.2254	4	4	0	1.8714
1961	0.6967	0.1345	4	4	0	1.9960
1962	0.7205	0.3287	14	13	1	8.6715
1963	0.7166	0.2130	18	12	6	10.0141
1964	0.6055	0.2519	39	28	11	16.7074
1965	0.4516	0.1621	29	17	12	6.6502
1966	0.4363	0.1776	32	21	11	7.0687
1967	0.3708	0.1925	39	21	18	6.7716
1968	0.3599	0.1726	33	19	14	5.2286
1969	0.2831	0.1154	38	15	23	3.5374
1970	0.2579	0.1081	27	6	21	2.0992
1971	0.2584	0.1052	30	15	15	2.3249
1972	0.2421	0.1360	23	9	14	1.7548
1973	0.2030	0.1176	30	7	23	1.6376
1974	0.2176	0.1391	26	0	26	1.7147
1975	0.2332	0.0950	12	0	12	0.7521

NUMBER OF OBSERVATIONS EQUALS 208

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	7.12(4)	0.00(0)	0.00(0)	0.00(0)	0.00(0)	1.42(4)
1956	6.60(2)	5.00(2)	1.62(1)	0.00(0)	0.00(0)	1.86(5)
1957	8.22(4)	6.07(3)	0.00(0)	0.00(0)	0.00(0)	2.22(7)
1958	0.00(0)	12.00(1)	0.00(0)	0.00(0)	0.00(0)	12.00(1)
1959	4.00(1)	0.00(0)	0.00(0)	0.00(0)	0.00(0)	0.80(1)
1960	7.67(3)	20.00(1)	0.00(0)	0.00(0)	0.00(0)	2.69(4)
1961	8.37(3)	6.00(1)	0.00(0)	0.00(0)	0.00(0)	1.94(4)
1962	9.67(10)	7.25(4)	0.00(0)	0.00(0)	0.00(0)	2.33(14)
1963	9.68(11)	7.00(6)	1.67(1)	0.00(0)	0.00(0)	2.40(18)
1964	10.46(22)	11.33(16)	1.75(1)	0.00(0)	0.00(0)	3.22(39)
1965	12.78(18)	13.92(9)	3.00(1)	4.00(1)	0.00(0)	3.59(29)
1966	14.08(19)	13.73(11)	3.00(1)	4.00(1)	0.00(0)	3.93(32)
1967	15.50(22)	18.88(15)	5.87(2)	0.00(0)	0.00(0)	5.05(39)
1968	18.92(16)	18.88(13)	4.45(3)	3.26(1)	0.00(0)	5.64(33)
1969	18.15(17)	23.43(16)	8.05(5)	0.00(0)	0.00(0)	6.93(38)
1970	21.57(11)	28.49(14)	15.87(2)	0.00(0)	0.00(0)	9.58(27)
1971	22.37(12)	26.30(10)	9.14(7)	4.00(1)	0.00(0)	7.57(30)
1972	31.14(10)	34.40(4)	11.92(6)	7.74(3)	0.00(0)	8.91(23)
1973	37.30(11)	35.81(14)	8.86(3)	4.80(2)	0.00(0)	11.38(30)
1974	40.93(7)	39.11(10)	11.30(8)	5.33(1)	0.00(0)	12.76(26)
1975	44.00(1)	37.42(6)	19.50(3)	10.00(2)	0.00(0)	17.43(12)

PLANNING DISTRICT 7

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.7058	0.1285	4	4	0	2.0423
1956	0.4901	0.1042	9	9	0	2.2489
1957	0.5552	0.1192	12	10	2	3.8550
1958	0.5797	0.1324	12	7	5	4.2248
1959	0.4610	0.1462	11	10	1	2.5517
1960	0.5374	0.1492	8	5	3	2.4661
1961	0.5164	0.1751	10	5	5	2.9425
1962	0.4667	0.1459	17	10	7	4.0442
1963	0.3583	0.0946	25	12	13	3.4239
1964	0.4412	0.3290	12	4	8	3.5261
1965	0.3595	0.1178	15	7	8	2.1323
1966	0.3560	0.1107	11	6	5	1.5163
1967	0.2261	0.0398	4	2	2	0.2092
1968	0.3703	0.1140	8	6	2	1.1879
1969	0.2979	0.0959	14	8	6	1.3616
1970	0.3039	0.1128	7	3	4	0.7229
1971	0.2304	0.0728	12	2	10	0.6955
1972	0.3234	0.0632	8	2	6	0.8647
1973	0.3405	0.1210	13	3	10	1.6830
1974	0.3096	0.0678	9	0	9	0.8997
1975	0.4583	0.2981	9	0	9	2.6013

NUMBER OF OBSERVATIONS EQUALS 115

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/
1955	18.00(1)	0.00(0)	3.30(3)	0.00(0)	0.00(0)	3.40(4)
1956	19.50(2)	15.80(5)	4.00(1)	2.94(1)	0.00(0)	5.98(9)
1957	12.00(1)	17.72(6)	6.77(4)	6.33(1)	0.00(0)	8.24(12)
1958	0.00(0)	18.50(3)	3.86(4)	3.79(5)	0.00(0)	4.51(12)
1959	24.30(1)	10.33(3)	6.21(4)	5.93(3)	0.00(0)	6.19(11)
1960	9.00(1)	25.67(3)	0.00(0)	4.05(4)	0.00(0)	4.83(8)
1961	23.50(2)	16.00(1)	7.20(3)	7.38(4)	0.00(0)	7.08(10)
1962	16.75(2)	24.75(6)	3.92(4)	4.68(5)	0.00(0)	5.48(17)
1963	31.12(4)	25.86(7)	8.00(6)	6.23(8)	0.00(0)	7.58(25)
1964	29.50(1)	42.10(5)	7.67(2)	32.27(4)	0.00(0)	27.26(12)
1965	64.70(2)	28.25(4)	5.67(1)	17.44(8)	0.00(0)	17.18(15)
1966	18.67(3)	15.30(5)	6.62(1)	11.01(2)	0.00(0)	9.31(11)
1967	34.50(2)	0.00(0)	10.00(2)	0.00(0)	0.00(0)	8.06(4)
1968	0.00(0)	20.67(3)	8.64(2)	6.51(3)	0.00(0)	7.66(8)
1969	30.00(1)	29.19(7)	11.32(4)	8.42(2)	0.00(0)	12.99(14)
1970	60.00(2)	27.95(2)	21.50(1)	11.22(2)	0.00(0)	12.53(7)
1971	0.00(0)	51.33(6)	13.40(4)	11.71(2)	0.00(0)	15.89(12)
1972	0.00(0)	41.10(2)	0.00(0)	10.93(6)	0.00(0)	11.83(8)
1973	50.00(2)	0.00(0)	18.57(4)	9.17(7)	0.00(0)	10.15(13)
1974	0.00(0)	42.67(3)	10.00(1)	8.90(5)	0.00(0)	9.74(9)
1975	45.67(3)	43.00(1)	13.60(3)	7.65(2)	0.00(0)	9.27(9)

PLANNING DISTRICT 8

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4855	0.1267	33	33	0	8.2918
1956	0.4861	0.1549	33	28	5	8.5643
1957	0.5247	0.1770	33	30	3	10.0887
1958	0.4203	0.1176	32	26	6	6.0804
1959	0.4362	0.1237	42	28	14	8.6201
1960	0.3827	0.1207	36	23	13	5.7835
1961	0.4145	0.1128	36	26	10	6.6320
1962	0.3689	0.0847	27	15	12	3.8606
1963	0.3606	0.0890	39	24	15	5.3724
1964	0.3492	0.0972	51	33	18	6.6933
1965	0.3057	0.0826	59	40	19	5.9106
1966	0.3030	0.0665	49	28	21	4.7099
1967	0.3003	0.0896	31	18	13	3.0365
1968	0.2842	0.0793	38	18	20	3.3010
1969	0.2447	0.0780	41	19	22	2.6990
1970	0.2676	0.0855	36	13	23	2.8342
1971	0.2291	0.0559	35	15	20	1.9437
1972	0.2230	0.0806	50	17	33	2.8037
1973	0.2104	0.0789	70	7	63	3.5273
1974	0.2097	0.0820	53	1	52	2.6809
1975	0.2124	0.0805	60	0	60	3.0882

NUMBER OF OBSERVATIONS EQUALS 442

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	10.44(9)	6.43(22)	5.49(2)	0.00(0)	6.35(33)
1956	0.00(0)	11.97(7)	6.65(24)	3.17(2)	0.00(0)	5.61(33)
1957	0.00(0)	13.25(4)	6.96(22)	3.64(7)	0.00(0)	5.08(33)
1958	0.00(0)	15.06(8)	6.61(24)	0.00(0)	0.00(0)	7.64(32)
1959	0.00(0)	12.65(15)	8.54(19)	4.45(8)	0.00(0)	6.21(42)
1960	0.00(0)	13.95(10)	6.92(20)	6.23(6)	0.00(0)	7.07(36)
1961	28.00(1)	15.44(8)	7.66(24)	4.90(3)	0.00(0)	7.33(36)
1962	0.00(0)	13.22(9)	7.03(13)	5.28(5)	0.00(0)	6.70(27)
1963	0.00(0)	16.55(10)	8.25(24)	6.42(5)	0.00(0)	8.06(39)
1964	0.00(0)	17.17(15)	8.23(29)	7.35(7)	0.00(0)	8.38(51)
1965	0.00(0)	18.32(21)	9.27(33)	6.26(5)	0.00(0)	9.18(59)
1966	40.00(1)	17.24(15)	8.99(29)	9.57(4)	0.00(0)	10.03(49)
1967	0.00(0)	19.71(9)	10.15(19)	7.13(3)	0.00(0)	10.21(31)
1968	0.00(0)	20.44(10)	10.39(25)	7.19(3)	0.00(0)	10.89(38)
1969	0.00(0)	24.07(14)	11.53(25)	15.25(2)	0.00(0)	14.31(41)
1970	0.00(0)	25.40(5)	12.17(27)	9.32(4)	0.00(0)	11.78(36)
1971	0.00(0)	25.35(11)	13.15(20)	10.92(4)	0.00(0)	12.70(35)
1972	0.00(0)	27.71(17)	14.11(24)	9.78(9)	0.00(0)	11.99(50)
1973	0.00(0)	29.36(27)	14.03(34)	9.53(9)	0.00(0)	12.75(70)
1974	0.00(0)	33.14(24)	18.94(25)	14.72(4)	0.00(0)	20.36(53)
1975	0.00(0)	33.01(18)	17.70(40)	9.31(2)	0.00(0)	17.93(60)

PLANNING DISTRICT 9

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.5827	0.1405	24	24	0	8.6039
1956	0.5180	0.1578	25	24	1	7.3057
1957	0.4887	0.1757	13	9	4	3.4749
1958	0.4822	0.1352	20	17	3	4.9970
1959	0.5167	0.1724	30	26	4	8.8718
1960	0.4704	0.1066	27	21	6	6.2706
1961	0.5026	0.3254	30	22	8	10.6491
1962	0.4513	0.1981	28	21	7	6.7613
1963	0.4228	0.1898	44	29	15	9.4155
1964	0.4274	0.1704	50	32	18	10.5575
1965	0.4069	0.1443	47	31	16	8.7380
1966	0.3855	0.1452	32	21	11	5.4093
1967	0.3605	0.1183	41	29	12	5.8884
1968	0.3740	0.1064	37	23	14	5.5839
1969	0.3553	0.1338	45	25	20	6.4672
1970	0.3104	0.0978	37	19	18	3.9082
1971	0.3173	0.0737	35	9	26	3.7083
1972	0.3305	0.1962	48	16	32	7.0529
1973	0.2648	0.1002	81	8	73	6.4814
1974	0.3202	0.1789	71	1	70	9.5190
1975	0.3414	0.2641	49	0	49	9.0591

NUMBER OF OBSERVATIONS EQUALS 407

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES SUNIT
1955	0.00(0)	14.00(5)	4.84(16)	2.33(3)	0.00(0)	4.85(24)
1956	0.00(0)	11.79(7)	4.98(17)	3.08(1)	0.00(0)	5.38(25)
1957	0.00(0)	17.76(5)	5.87(7)	2.79(1)	0.00(0)	6.51(13)
1958	0.00(0)	17.04(9)	6.03(11)	0.00(0)	0.00(0)	8.87(20)
1959	0.00(0)	12.92(6)	5.21(21)	2.00(3)	0.00(0)	5.07(30)
1960	0.00(0)	19.00(8)	5.73(17)	3.21(2)	0.00(0)	6.92(27)
1961	0.00(0)	19.62(8)	6.24(20)	2.87(2)	0.00(0)	7.18(30)
1962	0.00(0)	18.71(12)	5.52(14)	3.33(2)	0.00(0)	7.72(28)
1963	0.00(0)	21.00(12)	6.26(29)	2.44(3)	0.00(0)	7.26(44)
1964	0.00(0)	15.06(8)	6.12(40)	3.17(2)	0.00(0)	6.40(50)
1965	0.00(0)	20.73(13)	6.26(31)	4.78(3)	0.00(0)	7.63(47)
1966	0.00(0)	19.05(11)	5.99(21)	0.00(0)	0.00(0)	8.11(32)
1967	0.00(0)	20.36(11)	7.16(29)	4.62(1)	0.00(0)	8.56(41)
1968	0.00(0)	27.12(12)	5.93(24)	4.65(1)	0.00(0)	8.94(37)
1969	0.00(0)	28.65(18)	6.53(27)	0.00(0)	0.00(0)	11.06(45)
1970	0.00(0)	25.25(13)	6.89(23)	7.93(1)	0.00(0)	9.95(37)
1971	0.00(0)	23.19(8)	7.42(27)	0.00(0)	0.00(0)	8.99(35)
1972	0.00(0)	22.55(12)	8.59(34)	1.95(2)	0.00(0)	9.41(48)
1973	0.00(0)	29.47(32)	9.49(47)	5.92(2)	0.00(0)	13.10(81)
1974	0.00(0)	28.61(29)	7.89(39)	5.44(3)	0.00(0)	11.65(71)
1975	0.00(0)	33.95(23)	7.23(26)	0.00(0)	0.00(0)	13.84(49)

PLANNING DISTRICT 10

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.6644	0.1333	29	29	0	13.3004
1956	0.5817	0.1666	41	29	12	14.9820
1957	0.7091	0.2831	25	16	9	14.4948
1958	0.5807	0.1795	30	23	7	11.0518
1959	0.6620	0.2860	21	12	9	10.8402
1960	0.5562	0.1656	20	16	4	6.7083
1961	0.6716	0.2985	26	24	2	13.9539
1962	0.5835	0.1995	33	20	13	12.5090
1963	0.6846	0.4481	34	21	13	22.5610
1964	0.5800	0.2155	32	17	15	12.2043
1965	0.5439	0.2389	32	20	12	11.2357
1966	0.6494	0.2746	22	17	5	10.8610
1967	0.5420	0.2141	29	15	14	9.8022
1968	0.5478	0.3116	21	14	7	8.2425
1969	0.5698	0.2649	28	14	14	10.9872
1970	0.4877	0.2460	34	11	23	10.0839
1971	0.4393	0.2170	19	8	11	4.5145
1972	0.4380	0.1956	33	7	26	7.5565
1973	0.4624	0.2648	48	5	43	13.5571
1974	0.4473	0.2178	39	0	39	9.6059
1975	0.4972	0.3286	40	0	40	14.0988

NUMBER OF OBSERVATIONS EQUALS 318

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	8.02(4)	3.97(24)	6.08(1)	0.00(0)	4.77(29)
1956	0.00(0)	10.50(3)	4.22(36)	3.05(2)	0.00(0)	4.23(41)
1957	0.00(0)	5.37(4)	5.01(17)	4.51(4)	0.00(0)	4.77(25)
1958	0.00(0)	8.32(6)	4.59(23)	2.70(1)	0.00(0)	4.78(30)
1959	0.00(0)	8.25(4)	4.26(15)	3.13(2)	0.00(0)	4.20(21)
1960	0.00(0)	10.65(4)	4.71(15)	2.00(1)	0.00(0)	4.88(20)
1961	0.00(0)	7.00(4)	5.22(19)	2.23(3)	0.00(0)	4.16(26)
1962	0.00(0)	7.25(8)	5.18(23)	3.02(2)	0.00(0)	4.84(33)
1963	15.00(1)	10.40(5)	5.02(23)	2.23(5)	0.00(0)	4.10(34)
1964	0.00(0)	8.17(3)	5.23(26)	1.76(3)	0.00(0)	4.43(32)
1965	0.00(0)	12.37(8)	4.94(21)	2.14(3)	0.00(0)	4.42(32)
1966	0.00(0)	7.50(5)	4.26(17)	0.00(0)	0.00(0)	4.58(22)
1967	0.00(0)	8.07(7)	4.88(20)	2.60(2)	0.00(0)	4.84(29)
1968	0.00(0)	11.17(7)	5.44(12)	1.01(2)	0.00(0)	4.87(21)
1969	0.00(0)	11.10(11)	4.26(15)	2.08(2)	0.00(0)	5.07(28)
1970	0.00(0)	10.81(14)	4.75(14)	2.70(6)	0.00(0)	4.26(34)
1971	0.00(0)	10.25(4)	5.93(13)	4.27(2)	0.00(0)	5.78(19)
1972	0.00(0)	12.44(7)	5.51(22)	2.86(4)	0.00(0)	4.89(33)
1973	28.00(1)	13.17(17)	6.64(26)	2.65(4)	0.00(0)	6.47(48)
1974	0.00(0)	13.92(11)	6.11(27)	2.44(1)	0.00(0)	6.76(39)
1975	0.00(0)	11.69(12)	5.70(26)	2.07(2)	0.00(0)	5.89(40)

PLANNING DISTRICT 11

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4712	0.1715	9	9	0	2.2334
1956	0.4245	0.1087	18	16	2	3.4439
1957	0.4590	0.0841	13	8	5	2.8235
1958	0.4155	0.1062	18	18	0	3.2984
1959	0.4709	0.1440	16	16	0	3.8591
1960	0.4251	0.1172	19	18	1	3.6810
1961	0.4051	0.1050	36	31	5	6.2934
1962	0.3538	0.0756	16	14	2	2.0887
1963	0.3720	0.0993	27	23	4	3.9921
1964	0.3809	0.1034	33	26	7	5.1288
1965	0.3401	0.0940	50	36	14	6.2172
1966	0.3505	0.1081	31	26	5	4.1582
1967	0.3683	0.0899	38	31	7	5.4531
1968	0.4016	0.1476	31	24	7	5.6545
1969	0.3448	0.1196	37	30	7	4.9127
1970	0.3674	0.1366	38	28	10	5.8193
1971	0.3370	0.0906	43	32	11	5.2277
1972	0.3353	0.1801	42	14	28	6.0514
1973	0.3230	0.1179	107	14	93	12.6388
1974	0.3297	0.1285	94	2	92	11.7501
1975	0.3931	0.3109	116	0	116	29.0385

NUMBER OF OBSERVATIONS EQUALS 416

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/
1955	0.00(0)	10.75(2)	5.87(6)	2.83(1)	0.00(0)	5.49(9)
1956	0.00(0)	11.10(10)	5.82(8)	0.00(0)	0.00(0)	7.58(18)
1957	0.00(0)	15.50(1)	5.24(12)	0.00(0)	0.00(0)	5.55(13)
1958	0.00(0)	12.50(6)	6.02(11)	4.28(1)	0.00(0)	6.57(18)
1959	0.00(0)	11.00(5)	6.66(11)	0.00(0)	0.00(0)	7.38(16)
1960	0.00(0)	12.92(6)	5.72(13)	0.00(0)	0.00(0)	6.75(19)
1961	0.00(0)	13.56(9)	6.38(27)	0.00(0)	0.00(0)	7.21(36)
1962	0.00(0)	13.25(4)	8.11(11)	2.80(1)	0.00(0)	6.77(16)
1963	0.00(0)	12.69(8)	7.09(19)	0.00(0)	0.00(0)	7.89(27)
1964	0.00(0)	18.60(5)	6.78(27)	2.92(1)	0.00(0)	7.21(33)
1965	0.00(0)	16.87(15)	7.76(35)	0.00(0)	0.00(0)	9.11(50)
1966	0.00(0)	17.80(10)	7.11(21)	0.00(0)	0.00(0)	8.80(31)
1967	0.00(0)	16.50(11)	7.02(25)	4.48(2)	0.00(0)	7.54(38)
1968	0.00(0)	15.25(6)	7.05(23)	3.08(2)	0.00(0)	7.07(31)
1969	0.00(0)	15.91(7)	7.67(28)	13.14(2)	0.00(0)	9.99(37)
1970	0.00(0)	15.41(9)	7.09(28)	4.17(1)	0.00(0)	7.73(38)
1971	0.00(0)	19.50(11)	8.21(31)	2.82(1)	0.00(0)	9.20(43)
1972	0.00(0)	19.20(13)	8.63(28)	5.17(1)	0.00(0)	9.92(42)
1973	0.00(0)	16.24(34)	8.04(68)	5.41(5)	0.00(0)	8.45(107)
1974	0.00(0)	18.89(32)	7.53(61)	4.10(1)	0.00(0)	9.23(94)
1975	0.00(0)	20.58(34)	7.48(79)	7.85(3)	0.00(0)	9.19(116)

PLANNING DISTRICT 12

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4186	0.0916	21	21	0	3.8468
1956	0.4040	0.0664	26	25	1	4.3535
1957	0.3782	0.0659	19	16	3	2.7959
1958	0.3862	0.0825	22	17	5	3.4243
1959	0.3628	0.0853	23	20	3	3.1876
1960	0.3610	0.0693	25	20	5	3.3729
1961	0.3406	0.1159	30	25	5	3.8699
1962	0.3388	0.0789	41	30	11	4.9565
1963	0.3378	0.1339	43	30	13	5.6608
1964	0.2976	0.0644	55	32	23	5.0957
1965	0.3037	0.0605	41	28	13	3.9283
1966	0.2776	0.0504	33	26	7	2.6248
1967	0.2822	0.0606	44	29	15	3.6621
1968	0.2713	0.0469	34	18	16	2.5743
1969	0.2551	0.0566	42	29	13	2.8653
1970	0.2592	0.0603	34	13	21	2.4044
1971	0.2482	0.0590	46	26	20	2.9901
1972	0.2294	0.0517	52	10	42	2.8725
1973	0.2146	0.0526	108	6	102	5.2704
1974	0.2128	0.0470	60	1	59	2.8475
1975	0.2192	0.0665	45	0	45	2.3559

NUMBER OF OBSERVATIONS EQUALS 422

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	12.41(11)	5.30(10)	0.00(0)	0.00(0)	7.41(21)
1956	0.00(0)	12.86(14)	6.25(12)	0.00(0)	0.00(0)	8.50(26)
1957	0.00(0)	13.45(6)	6.32(13)	0.00(0)	0.00(0)	7.51(19)
1958	0.00(0)	12.95(10)	6.59(12)	0.00(0)	0.00(0)	8.27(22)
1959	0.00(0)	14.10(10)	6.56(13)	0.00(0)	0.00(0)	8.44(23)
1960	0.00(0)	14.20(10)	7.36(15)	0.00(0)	0.00(0)	8.91(25)
1961	0.00(0)	15.10(13)	7.34(17)	0.00(0)	0.00(0)	9.24(30)
1962	0.00(0)	15.60(10)	7.71(31)	0.00(0)	0.00(0)	8.64(41)
1963	0.00(0)	15.22(19)	7.86(23)	4.92(1)	0.00(0)	9.41(43)
1964	0.00(0)	17.70(23)	8.80(32)	0.00(0)	0.00(0)	10.36(55)
1965	0.00(0)	17.58(15)	8.52(26)	0.00(0)	0.00(0)	10.24(41)
1966	0.00(0)	17.30(15)	9.74(18)	0.00(0)	0.00(0)	11.77(33)
1967	0.00(0)	18.21(22)	9.11(22)	0.00(0)	0.00(0)	11.78(44)
1968	0.00(0)	17.64(17)	9.52(16)	5.75(1)	0.00(0)	11.38(34)
1969	0.00(0)	20.37(20)	10.25(20)	9.39(2)	0.00(0)	12.21(42)
1970	0.00(0)	20.38(15)	11.46(18)	6.72(1)	0.00(0)	13.19(34)
1971	0.00(0)	20.64(15)	10.01(30)	7.75(1)	0.00(0)	11.58(46)
1972	0.00(0)	23.82(25)	11.44(26)	10.27(1)	0.00(0)	14.33(52)
1973	0.00(0)	25.19(52)	12.05(56)	0.00(0)	0.00(0)	15.68(108)
1974	0.00(0)	24.71(22)	13.11(36)	8.50(2)	0.00(0)	14.77(60)
1975	0.00(0)	24.53(24)	11.00(20)	9.75(1)	0.00(0)	14.84(45)

PLANNING DISTRICT 13

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.3854	0.0890	21	21	0	3.2778
1956	0.3500	0.0879	26	23	3	3.3775
1957	0.3922	0.0772	19	17	2	3.0293
1958	0.3316	0.0765	24	18	6	2.7736
1959	0.3323	0.0554	29	21	8	3.2883
1960	0.3426	0.1269	27	22	5	3.5873
1961	0.3158	0.0633	41	34	7	4.2488
1962	0.3188	0.0924	34	25	9	3.7378
1963	0.2936	0.0490	50	28	22	4.4289
1964	0.2776	0.0548	45	33	12	3.5987
1965	0.2718	0.0622	51	34	17	3.9612
1966	0.2779	0.0629	43	38	5	3.4861
1967	0.2713	0.0800	56	37	19	4.4756
1968	0.2472	0.0459	44	29	15	2.7789
1969	0.2481	0.0306	32	26	6	1.9991
1970	0.2285	0.0418	30	15	15	1.6164
1971	0.2147	0.0360	43	19	24	2.0362
1972	0.2094	0.0407	78	22	56	3.5476
1973	0.1923	0.0351	98	13	85	3.7417
1974	0.1885	0.0368	73	2	71	2.6925
1975	0.1896	0.0395	90	0	90	3.3746

NUMBER OF OBSERVATIONS EQUALS 477

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/
1955	0.00(0)	14.92(15)	7.40(6)	0.00(0)	0.00(0)	11.58(21)
1956	0.00(0)	14.96(19)	7.98(7)	0.00(0)	0.00(0)	12.00(26)
1957	0.00(0)	16.45(13)	7.33(6)	0.00(0)	0.00(0)	12.07(19)
1958	0.00(0)	15.11(21)	7.42(3)	0.00(0)	0.00(0)	13.40(24)
1959	0.00(0)	16.12(20)	8.21(9)	0.00(0)	0.00(0)	12.07(29)
1960	0.00(0)	17.33(22)	8.05(5)	0.00(0)	0.00(0)	14.43(27)
1961	0.00(0)	18.12(29)	9.26(12)	0.00(0)	0.00(0)	13.84(41)
1962	0.00(0)	17.63(24)	10.42(10)	0.00(0)	0.00(0)	14.35(34)
1963	0.00(0)	18.52(33)	11.28(17)	0.00(0)	0.00(0)	14.69(50)
1964	0.00(0)	21.78(39)	11.88(6)	0.00(0)	0.00(0)	19.31(45)
1965	0.00(0)	22.09(40)	11.31(11)	0.00(0)	0.00(0)	18.16(51)
1966	0.00(0)	22.13(37)	10.55(6)	0.00(0)	0.00(0)	19.12(43)
1967	0.00(0)	21.02(45)	12.44(11)	0.00(0)	0.00(0)	18.20(56)
1968	0.00(0)	23.12(36)	11.77(8)	0.00(0)	0.00(0)	19.48(44)
1969	0.00(0)	25.08(25)	14.44(7)	0.00(0)	0.00(0)	21.26(32)
1970	0.00(0)	24.92(24)	15.43(6)	0.00(0)	0.00(0)	21.76(30)
1971	0.00(0)	27.05(33)	16.25(10)	0.00(0)	0.00(0)	22.97(43)
1972	0.00(0)	28.84(62)	15.36(16)	0.00(0)	0.00(0)	24.06(78)
1973	0.00(0)	30.02(80)	16.83(17)	0.00(0)	24.00(1)	25.91(98)
1974	0.00(0)	31.54(61)	19.12(12)	0.00(0)	0.00(0)	28.03(73)
1975	0.00(0)	31.59(76)	18.99(13)	0.00(0)	26.00(1)	28.26(90)

PLANNING DISTRICT 14

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.3856	0.0937	24	24	0	3.7697
1956	0.3713	0.0748	24	23	1	3.4369
1957	0.3162	0.0822	17	15	2	1.8073
1958	0.3300	0.0596	20	17	3	2.2458
1959	0.3434	0.0851	27	23	4	3.3717
1960	0.3123	0.0592	31	27	4	3.1280
1961	0.2979	0.0565	49	35	14	4.5022
1962	0.3116	0.0898	25	19	6	2.6215
1963	0.2978	0.0733	50	33	17	4.6972
1964	0.2907	0.0712	43	29	14	3.8476
1965	0.2607	0.0444	62	41	21	4.3325
1966	0.2505	0.0613	30	18	12	1.9908
1967	0.2636	0.0612	42	30	12	3.0722
1968	0.2636	0.1079	48	30	18	3.8828
1969	0.2432	0.0761	33	18	15	2.1375
1970	0.2164	0.0384	30	12	18	1.4481
1971	0.2209	0.0472	50	20	30	2.5496
1972	0.2051	0.0410	52	9	43	2.2735
1973	0.1942	0.0339	81	8	73	3.1456
1974	0.1921	0.0478	65	0	65	2.5463
1975	0.1928	0.0495	59	0	59	2.3343

NUMBER OF OBSERVATIONS EQUALS 431

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	11.04(13)	7.07(11)	0.00(0)	0.00(0)	8.54(24)
1956	0.00(0)	12.49(14)	6.90(10)	0.00(0)	0.00(0)	9.20(24)
1957	0.00(0)	10.15(10)	7.19(7)	0.00(0)	0.00(0)	8.37(17)
1958	0.00(0)	13.75(12)	6.53(8)	0.00(0)	0.00(0)	9.62(20)
1959	0.00(0)	14.15(13)	6.88(14)	0.00(0)	0.00(0)	9.13(27)
1960	0.00(0)	14.86(22)	6.62(9)	0.00(0)	0.00(0)	10.83(31)
1961	0.00(0)	15.51(38)	8.18(11)	0.00(0)	0.00(0)	12.68(49)
1962	0.00(0)	15.76(17)	6.12(8)	0.00(0)	0.00(0)	10.94(25)
1963	0.00(0)	16.57(26)	8.15(24)	0.00(0)	0.00(0)	10.96(50)
1964	0.00(0)	15.93(24)	8.41(19)	0.00(0)	0.00(0)	11.28(43)
1965	0.00(0)	17.83(48)	9.23(14)	0.00(0)	0.00(0)	14.59(62)
1966	0.00(0)	19.17(27)	9.71(3)	0.00(0)	0.00(0)	17.22(30)
1967	0.00(0)	17.53(25)	10.35(17)	0.00(0)	0.00(0)	13.30(42)
1968	0.00(0)	18.15(34)	10.03(13)	2.50(1)	0.00(0)	13.33(48)
1969	0.00(0)	19.64(21)	10.27(12)	0.00(0)	0.00(0)	14.37(33)
1970	0.00(0)	23.29(22)	11.52(8)	0.00(0)	0.00(0)	17.69(30)
1971	0.00(0)	24.16(36)	9.77(14)	0.00(0)	0.00(0)	17.39(50)
1972	0.00(0)	23.14(39)	11.80(13)	0.00(0)	0.00(0)	18.40(52)
1973	0.00(0)	24.63(60)	12.90(21)	0.00(0)	0.00(0)	19.54(81)
1974	0.00(0)	25.31(47)	13.23(17)	6.00(1)	0.00(0)	18.87(65)
1975	0.00(0)	25.52(42)	12.84(17)	0.00(0)	0.00(0)	19.50(59)

PLANNING DISTRICT 15

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.4880	0.2026	8	8	0	2.1927
1956	0.4688	0.1752	9	8	1	2.2238
1957	0.4510	0.1567	12	12	0	2.7105
1958	0.3307	0.0882	16	14	2	1.8669
1959	0.3680	0.0857	9	9	0	1.2775
1960	0.3952	0.0769	22	20	2	3.5595
1961	0.3853	0.1259	15	13	2	2.4484
1962	0.4055	0.1509	6	5	1	1.1007
1963	0.4351	0.2113	21	18	3	4.8675
1964	0.3937	0.1246	22	20	2	3.7358
1965	0.3655	0.1345	24	17	7	3.6226
1966	0.4356	0.1363	12	11	1	2.4813
1967	0.3724	0.1199	35	31	4	5.3420
1968	0.3805	0.1222	30	20	10	4.7758
1969	0.3439	0.0922	43	30	13	5.4409
1970	0.3221	0.0889	39	32	7	4.3454
1971	0.3234	0.1599	30	22	8	3.8800
1972	0.3017	0.0956	33	17	16	3.2958
1973	0.3350	0.1522	92	9	83	12.4332
1974	0.3635	0.2252	53	1	52	9.6393
1975	0.2917	0.1841	103	0	103	12.2181

NUMBER OF OBSERVATIONS EQUALS 317

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES SUNIT
1955	0.00(0)	13.90(5)	5.11(3)	0.00(0)	0.00(0)	8.25(8)
1956	0.00(0)	14.75(2)	6.11(6)	2.75(1)	0.00(0)	5.98(9)
1957	0.00(0)	13.62(4)	6.35(7)	3.17(1)	0.00(0)	6.72(12)
1958	0.00(0)	13.80(10)	7.46(6)	0.00(0)	0.00(0)	10.22(16)
1959	0.00(0)	14.20(5)	7.25(4)	0.00(0)	0.00(0)	9.57(9)
1960	0.00(0)	14.55(10)	6.96(11)	5.67(1)	0.00(0)	8.54(22)
1961	0.00(0)	15.00(6)	7.09(9)	0.00(0)	0.00(0)	8.92(15)
1962	0.00(0)	13.33(3)	5.28(3)	0.00(0)	0.00(0)	7 29(6)
1963	0.00(0)	16.17(6)	6.84(13)	4.38(2)	0.00(0)	7.37(21)
1964	0.00(0)	19.25(4)	7.17(17)	4.58(1)	0.00(0)	7.80(22)
1965	0.00(0)	15.70(13)	5.39(11)	0.00(0)	0.00(0)	9.14(24)
1966	0.00(0)	15.75(2)	7.13(10)	0.00(0)	0.00(0)	7.75(12)
1967	0.00(0)	16.73(17)	7.35(16)	4.25(2)	0.00(0)	9.17(35)
1968	0.00(0)	16.25(12)	8.14(15)	4.50(3)	0.00(0)	8.61(30)
1969	0.00(0)	19.86(14)	8.98(28)	4.67(1)	0.00(0)	10.43(43)
1970	0.00(0)	19.38(13)	8.32(24)	5.21(2)	0.00(0)	9.03(39)
1971	0.00(0)	18.07(15)	9.64(15)	0.00(0)	0.00(0)	11.31(30)
1972	0.00(0)	20.42(14)	10.19(18)	4.17(1)	0.00(0)	12.01(33)
1973	0.00(0)	20.39(47)	8.12(42)	4.17(3)	0.00(0)	10.32(92)
1974	0.00(0)	18.71(19)	9.06(30)	4.39(4)	0.00(0)	9.34(53)
1975	0.00(0)	22.44(47)	10.57(52)	3.57(4)	0.00(0)	12.67(103)

PLANNING DISTRICT 16

YEAR	AVER. A/S	ST.DEV.	N	SALE1	SALE2	SUM.SQ. A/S
1955	0.6333	0.0000	1	1	0	0.4011
1956	0.4745	0.2023	6	6	0	1.5554
1957	0.4259	0.0346	6	6	0	1.0944
1958	0.5323	0.0895	5	5	0	1.4486
1959	0.4639	0.1443	7	7	0	1.6314
1960	0.4401	0.0886	9	7	2	1.8063
1961	0.4382	0.0966	6	6	0	1.1988
1962	0.3384	0.0782	5	4	1	0.5970
1963	0.3486	0.0765	9	8	1	1.1403
1964	0.3871	0.1213	23	19	4	3.7706
1965	0.4093	0.1076	15	12	3	2.6752
1966	0.3951	0.1489	13	10	3	2.2955
1967	0.3872	0.0886	11	8	3	1.7276
1968	0.3868	0.1324	10	8	2	1.6541
1969	0.4122	0.0986	11	10	1	1.9662
1970	0.4785	0.2000	6	6	0	1.5736
1971	0.4327	0.1434	7	5	2	1.4338
1972	0.3581	0.1788	19	7	12	3.0123
1973	0.3865	0.1374	43	1	42	7.2173
1974	0.3505	0.1213	35	2	33	4.8008
1975	0.4093	0.2842	29	0	29	7.1202

NUMBER OF OBSERVATIONS EQUALS 138

YEAR	LDG.HOUSES PRICE	SINGLE FAM. PRICE	2-4 UNITS PRICE/UNIT	5+ UNITS PRICE/UNIT	CONDOMINIUMS PRICE	TOTAL PRICE/UNIT IMPUTES 5UNITS/L.H.
1955	0.00(0)	0.00(0)	3.75(1)	0.00(0)	0.00(0)	3.75(1)
1956	0.00(0)	14.50(1)	3.71(5)	0.00(0)	0.00(0)	4.43(6)
1957	0.00(0)	8.80(5)	5.17(1)	0.00(0)	0.00(0)	7.44(6)
1958	0.00(0)	11.00(1)	3.82(4)	0.00(0)	0.00(0)	4.42(5)
1959	0.00(0)	13.50(1)	4.76(6)	0.00(0)	0.00(0)	5.27(7)
1960	0.00(0)	14.00(2)	5.18(6)	3.75(1)	0.00(0)	5.54(9)
1961	0.00(0)	7.00(1)	5.25(5)	0.00(0)	0.00(0)	5.37(6)
1962	0.00(0)	15.00(2)	4.67(3)	0.00(0)	0.00(0)	6.55(5)
1963	0.00(0)	10.37(4)	5.14(4)	3.17(1)	0.00(0)	5.57(9)
1964	0.00(0)	14.43(7)	4.99(15)	5.17(1)	0.00(0)	6.17(23)
1965	0.00(0)	13.40(5)	5.64(10)	0.00(0)	0.00(0)	6.82(15)
1966	0.00(0)	9.75(4)	4.80(9)	0.00(0)	0.00(0)	5.46(13)
1967	0.00(0)	10.00(4)	6.00(7)	0.00(0)	0.00(0)	6.67(11)
1968	0.00(0)	22.17(3)	5.78(7)	0.00(0)	0.00(0)	8.12(10)
1969	0.00(0)	17.00(3)	6.17(8)	0.00(0)	0.00(0)	7.42(11)
1970	0.00(0)	0.00(0)	6.26(5)	10.12(1)	0.00(0)	8.83(6)
1971	0.00(0)	15.50(1)	6.93(5)	5.41(1)	0.00(0)	6.01(7)
1972	0.00(0)	13.87(8)	6.41(11)	0.00(0)	0.00(0)	8.02(19)
1973	0.00(0)	13.85(11)	6.33(31)	2.50(1)	0.00(0)	6.90(43)
1974	0.00(0)	16.10(9)	6.22(26)	0.00(0)	0.00(0)	7.32(35)
1975	0.00(0)	14.61(10)	6.23(17)	8.65(2)	0.00(0)	7.81(29)

Table A1

NUMBER OF DWELLING UNITS BY PLANNING DISTRICT

YR.	REGION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
50	222,065	13,943	6,957	15,178	10,612	9,188	15,356	13,082	21,314	15,628	33,438	22,002	9,238	7,087	7,598	12,068	9,376
51	223,738	13,948	6,905	15,116	10,529	9,580	15,905	13,279	21,528	15,696	33,210	22,046	9,338	7,210	7,765	12,201	9,484
52	225,411	13,952	6,854	15,053	10,446	9,973	16,455	13,475	21,742	15,763	32,981	22,090	9,437	7,333	7,932	12,334	9,591
53	227,084	13,957	6,802	14,991	10,363	10,365	17,004	13,672	21,955	15,831	32,753	22,134	9,537	7,457	8,099	12,467	9,699
54	228,757	13,961	6,750	14,929	10,280	10,757	17,553	13,869	22,169	15,898	32,524	22,178	9,636	7,580	8,266	12,600	9,807
55	230,431	13,966	6,699	14,867	10,197	11,150	18,103	14,066	22,383	15,966	32,296	22,222	9,736	7,703	8,434	12,733	9,915
56	232,103	13,971	6,647	14,804	10,114	11,542	18,652	14,262	22,597	16,033	32,067	22,266	9,835	7,826	8,601	12,865	10,022
57	233,777	13,975	6,595	14,742	10,031	11,934	19,201	14,459	22,811	16,101	31,839	22,310	9,935	7,949	8,768	12,998	10,130
58	235,450	13,980	6,543	14,680	9,948	12,326	19,750	14,656	23,024	16,168	31,610	22,354	10,034	8,073	8,935	13,131	10,238
59	237,123	13,984	6,492	14,617	9,865	12,719	20,300	14,852	23,238	16,236	31,382	22,398	10,134	8,196	9,102	13,264	10,345
60	238,796	13,989	6,440	14,555	9,782	13,111	20,849	15,049	23,452	16,303	31,153	22,442	10,233	8,319	9,269	13,397	10,453
61	238,156	13,961	6,308	14,525	9,770	13,362	19,836	14,868	23,639	16,382	30,534	22,524	10,435	8,590	9,416	13,552	10,454
62	237,517	13,933	6,176	14,496	9,758	13,613	18,823	14,688	23,826	16,461	29,914	22,606	10,637	8,860	9,562	13,708	10,456
63	236,877	13,905	6,044	14,466	9,747	13,864	17,810	14,507	24,014	16,540	29,295	22,688	10,839	9,131	9,709	13,863	10,457
64	236,238	13,877	5,912	14,437	9,735	14,115	16,797	14,327	24,201	16,619	28,675	22,770	11,041	9,402	9,855	14,018	10,458
65	235,599	13,849	5,780	14,407	9,723	14,367	15,784	14,146	24,388	16,698	28,056	22,852	11,243	9,673	10,002	14,174	10,460
66	234,959	13,821	5,647	14,377	9,711	14,618	14,771	13,965	24,575	16,777	27,436	22,933	11,445	9,943	10,149	14,329	10,461
67	234,319	13,793	5,515	14,348	9,699	14,869	13,758	13,785	24,762	16,856	26,817	23,015	11,647	10,214	10,295	14,484	10,462
68	233,680	13,765	5,383	14,318	9,688	15,120	12,745	13,604	24,950	16,935	26,197	23,097	11,849	10,485	10,442	14,639	10,463
69	233,040	13,737	5,251	14,289	9,676	15,371	11,732	13,424	25,137	17,014	25,578	23,179	12,051	10,755	10,588	14,795	10,465
70	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466
71	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466
72	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466
73	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466
74	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466
75	232,401	13,709	5,119	14,259	9,664	15,622	10,719	13,243	25,324	17,093	24,958	23,261	12,253	11,026	10,735	14,950	10,466

YR.	BOSTON	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
50	1.0	.063	.031	.068	.048	.041	.069	.059	.096	.070	.151	.099	.042	.032	.034	.054	.042
51	1.0	.062	.031	.068	.047	.043	.071	.059	.096	.070	.148	.099	.042	.032	.035	.055	.042
52	1.0	.062	.030	.067	.046	.044	.073	.060	.096	.070	.146	.098	.042	.033	.035	.055	.043
53	1.0	.061	.030	.066	.046	.046	.075	.060	.097	.070	.144	.097	.042	.033	.036	.055	.043
54	1.0	.061	.030	.065	.045	.047	.077	.061	.097	.069	.142	.097	.042	.033	.036	.055	.043
55	1.0	.061	.029	.065	.044	.048	.079	.061	.097	.069	.140	.096	.042	.033	.037	.055	.043
56	1.0	.060	.029	.064	.044	.050	.080	.061	.097	.069	.138	.096	.042	.034	.037	.055	.043
57	1.0	.060	.028	.063	.043	.051	.082	.062	.098	.069	.136	.095	.042	.034	.038	.056	.043
58	1.0	.059	.028	.062	.042	.052	.084	.062	.098	.069	.134	.095	.043	.034	.038	.056	.043
59	1.0	.059	.027	.062	.042	.054	.086	.063	.098	.068	.132	.094	.043	.035	.038	.056	.044
60	1.0	.059	.027	.061	.041	.055	.087	.063	.098	.068	.130	.094	.043	.035	.039	.056	.044
61	1.0	.059	.026	.061	.041	.056	.083	.062	.099	.069	.128	.095	.044	.036	.040	.057	.044
62	1.0	.059	.026	.061	.041	.057	.079	.062	.100	.069	.126	.095	.045	.037	.040	.058	.044
63	1.0	.059	.026	.061	.041	.059	.075	.061	.101	.070	.124	.096	.046	.039	.041	.059	.044
64	1.0	.059	.025	.061	.041	.060	.071	.061	.102	.070	.121	.096	.047	.040	.042	.059	.044
65	1.0	.059	.025	.061	.041	.061	.067	.060	.104	.071	.119	.097	.048	.041	.042	.060	.044
66	1.0	.059	.024	.061	.041	.062	.063	.059	.105	.071	.117	.098	.049	.042	.043	.061	.045
67	1.0	.059	.024	.061	.041	.063	.059	.059	.106	.072	.114	.098	.050	.044	.044	.062	.045
68	1.0	.059	.023	.061	.041	.065	.055	.058	.107	.072	.112	.099	.051	.045	.045	.063	.045
69	1.0	.059	.023	.061	.042	.066	.050	.058	.108	.073	.110	.099	.052	.046	.045	.063	.045
70	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045
71	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045
72	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045
73	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045
74	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045
75	1.0	.059	.022	.061	.042	.067	.046	.057	.109	.074	.107	.100	.053	.047	.046	.064	.045

Percent of Boston dwelling units within Planning Districts.

Appendix III-B

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July 16, 1980

PRELIMINARY ESTIMATES OF THE 1979 RESIDENTIAL VALUE INDEX

The trends of residential property market value growth in Boston and its 22 Wards over the 1955-1979 period are reflected in the attached tables and graphs. The Residential Value Index (RVI) summarizes the average annual percentage price change for residential properties in Boston neighborhoods that were sold more than once during the study period. The Index does not show what prices are, but rather how they have been changing. The (preliminary) 1979 figures represent only the first six months of that year and should be viewed with caution since data limitations necessitated special sample selection and calculation procedures. Methods and interpretations for the RVI in general and the 1979 figures in particular are described below.

The most significant feature of the new value trend series is evidence of resumption of growth between 1975 and the first half of 1979 after virtual stagnation from 1973 to 1975. While the Boston composite Index remained essentially unchanged between 1973 and 1975, cumulative growth from 1975 to early 1979 was 34.1 percent (an average annually compounded growth rate of 8.1 percent*). By way of comparison we note that the Boston Consumer Price Index for Urban Wage Earners and Clerical Workers rose 25.8 percent (an annually compounded rate of 6.5 percent**) over a comparable period (July, 1975 to March, 1979).

These comparisons should not be taken at face value, however. While the CPI is adjusted for price changes resulting from "quality" changes,

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* Over a period of 3 years, 9 months (6/75 to 3/79).
** Over a period of 3 years, 8 months.

our RVI is only partially adjusted. It shows the combined effects both of neighborhood value trends for unchanged properties due to supply and demand shifts and also of property-specific price changes due to maintenance, deterioration, or improvement. We cannot completely sort out these two types of value change factors.

A Sales Pair Approach Helps the RVI Control for Quality Variations

The "sales pair" approach used by the Residential Value Index provides a significant level of control over the changing quality component of price change. Each sales pair observation consists of prices paid for the same property at two different points in time. This protects the Index from the effects of annual variations in the size or quality of properties sold. For example: If many of the larger or better homes in a neighborhood sold during one year and the following year's sales were dominated by smaller or poorer homes, a measure such as the average price of homes could show a decline when neighborhood values were actually on the rise. Our Index, on the other hand, would reflect the relative price changes shown by each individual home since it was last sold. Of course we cannot expect properties to stay exactly the same over time. But we can try to limit our analysis sample to properties that have experienced only a "typical" degree of change.

Sample Selection

The purpose of the Index is to summarize the overall trend of prices over time for the typical residential property in a neighborhood. For this reason, observations from the 1955-1975 sample were deleted if the deterioration/improvement component of price change appeared very atypical by either of two sets of criteria:

1) conversion from one occupancy use to another (e.g., from a one-family home to a three-family home)

2) conveyance through a default entity, such as a bank, the City, or HUD. These properties stand a greater than average chance of having experienced a period of vacancy that could result in rapid deterioration. Furthermore, the method of sale could yield a price different from that which the property would command in "normal" markets.

Although properties meeting these two rejection criteria occur throughout the City, we do not know precisely to what extent they occur. Further, they are more likely to be sold than their more staid neighboring properties and so by counting them we might over-represent these rejected parcels in our sample. In the past (the Index through 1975) we simply excluded these relatively few properties and explained that the Index described the average experience of value growth for the vast majority of residential properties that were acceptable for our sample.

Changed Data Rules = Changed Interpretation

But reality is rather more complex than the simple analytic model that our Residential Value Index estimates. In some of the more dynamic market areas what was once the exception is now the rule. For example, of the twelve properties from Ward 4 (Fenway-South End) having their second sal in the first half of 1979, nine had recorded occupancy uses different from those listed during the year of first sale. The changes were from one-family homes to apartments or vice versa or from lodging houses to one, two, or multi-family dwellings. Of six sales-pair properties in Ward 9 (Central Roxbury) five had changed from lodging houses to other uses. If we do not count these changed properties we just will not have enough "acceptable"

observations to obtain a meaningful average. Instead we have counted them in our sample and we describe the 1979 Index figures as representing the average price change for all properties except condominiums sold during the first half of 1979 and showing an earlier price from which to measure proportional value change. Because condominiums are a very special and limited phenomena we desired and were able to exclude them from our sample. Condos are examined in a separate analysis.

Ideally we would use the Residential Value Index to follow price changes for essentially unchanged properties and use other measures (which could include a modified Index analysis) to chart special value influences. Lacking sufficient data to accomplish this we have had to change the rules and thus change the interpretation of the Residential Value Index for the preliminary measure through 1979's first six months. These 1979 figures are probably somewhat higher than we would obtain under the old rules and interpretation. How much higher we don't know. We will not be able to answer this question until we have more data to work with.

1979 Sample

The following table lists the sample size of sales pair observations for the first six months of 1979. The number and percent of sample members listed as having experienced an occupancy use change between sales dates are indicated also. Condominium properties have been excluded from this sample and are examined in a separate report.

1979 RVI SAMPLE

Ward	Sample Size	Use Change	
		Number	%
1	16	1	6.3
2	14	1	7.1
3	14	9	64.3
4	12	9	75.0
5	29	6	20.7
6	24	7	29.2
7	16	1	6.3
8	7	4	57.1
9	6	5	83.3
10	16	2	12.5
11	11	2	18.2
12	3	0	0
13	17	2	11.8
14	16	1	6.3
15	26	0	0
16	47	0	0
17	36	8	22.2
18	55	2	3.6
19	48	3	6.3
20	63	5	7.9
21	17	2	11.8
22	21	1	4.8
Total	514	71	13.8

Calculation Methods

The 1955-1975 neighborhood Residential Value Indices were estimated by a multiple linear regression model. The technique is described in detail in the Appendices to Residential Property Market Values in Boston by Robert F. Engle and John Avault (BRA Research, 1973) or in "A Regression Method for Real Estate Price Index Construction" by Bailey, Muth, and Nourse (Journal of the American Statistical Association, 1963, pp. 933-942). The regression approach has the virtues of providing estimates of minimum

variance and known standard error. Furthermore, the regression method is efficient, utilizing data with any final sales year to provide information for all earlier years' Index values as well as for the year of final sale.

But there are problems in using the regression technique to perform the 1979 update. Every time we use the regression to estimate the RVI for one new period we add to the information about all previous periods and so change the entire series. In our present situation this would be more than just inconvenient. Because, as described earlier, the 1979 data set is different from our earlier data, it would "taint" the earlier series and make interpretation quite difficult. Another apparent problem is the issue of missing years (we have no data for 1976, 1977, 1978). The Index will not calculate with a missing year.* In fact, however, we could avoid this difficulty by treating 1979 as if it were 1976 when we calculate, and then labeling it properly as 1979 after the regression was performed. Still, the more serious problem of mixing different data sets and changing earlier years will not go away.

The preliminary estimates of the 1979 RVI were accomplished by a "link relative" approach.** Not only does this technique avoid the influence of new data on the old series, it also approaches the regression analysis in efficiency for later-year updates.*** Here is how the link relative method works for updating:

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* A zero column vector in our matrix of independent variables will preclude matrix inversion and solution.

** A good description of this method has been provided by Herman Wyngarden in "An Index of Local Real Estate Prices" (Michigan Business Studies, January 1927)

*** See Bailey, Muth, and Nourse, op. cit.

The Index is designed to show what prices were in a given year relative to observed or imputed prices in the base year. With the link relative technique, we first calculate the relative price of second to first sales, then link that relative value to the Index series by multiplying it by the first sales year's Index value, and finally average together all the link relatives with the same second sales year.

An example: Suppose we wish to update the East Boston (Ward 1) Index from 1975 to 1979. One of the properties sold in 1979 for $30,000 and had been sold in 1970 for $15,000. The price relative is $30,000/$15,000 = 2. Multiplying this relative (2) by the 1970 East Boston Index value (2.241) adjusts it to the 1955 base year. The product of 2 and 2.241 = 4.482 is an observation for the 1979 East Boston Index value. We average all such observations by taking their arithmetic mean* and so arrive at the 1979 update value for the Ward 1 Index.

Another way to view this link relative process is to imagine that we infer a 1975 value from the first sales price (This first sale must, of course, occur no later than 1975 since our Index does not go beyond that year) by multiplying that first price by the ratio of the 1975 Index number to the first sale year's Index number. We then divide the 1979 observed price by the 1975 inferred price to express it as a relative. Finally, we average all of the relatives (1979 prices relative to their 1975 counterparts) and multiply that average by the 1975 Index number. The resulting 1979 Index figure is the same as that obtained by the previously described

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* Bailey, Muth, and Nourse suggest using the geometric mean, but I can see no good reason for this. The geometric mean would be appropriate for time-series averaging, but our situation here is essentially cross-sectional.

procedures. These are just two different views of the same process.

To put it more concisely:

$$I_{t'} = \sum_{i=1}^{n} \left\{ \left(P_{t',i} \Big/ P_{t,i} \right) \cdot I_t \right\} \Big/ n$$

where I_t is the Index number for year "t"

and t' is the new year we wish to update for

$P_{t,i}$ is the price for property "i" in year "t"

and n is the total number of sales pair properties in our sample.

The Boston City RVI: Neighborhood Boundaries and Weights

The City RVI was calculated as a weighted average of the neighborhood RVIs. For the 1955-75 series, the weights are the proportions of dwelling units contained in each of the City's sixteen (old) BRA Planning Districts and the Districts constitute the neighborhoods. These Planning Districts have defined neighborhoods for the RVI since the 1946-1972 series was published in 1973 (Engle and Avault, op. cit.). We have continued to rely on the Planning Districts as our principal Index areas both for the sake of consistency and because they have some basis in housing and population characteristics. The Index update for Planning Districts through 1975 and the dwelling unit count and corresponding neighborhood weights are described in the memorandum "Update of Residential Property Market Value Index through 1975" (from John Avault to Alex Ganz; August 20, 1979).

The RVI was first calculated for the City's twenty-two Wards and presented in a memorandum of August 20, 1979: "Differences Among Neighborhood Property Value Growth Rates Continue to Aggravate Assessment/Sales Ratio

Inequalities" (from John Avault to the Tax Policy Study Group). Another note from August 20, 1979 (by Avault and Paul Babcock) listed the "Residential Property Market Value Index for Census Tracts in Boston." We are grateful to the Massachusetts State Banking Commission Research Department for their efforts in geocoding the Index data base for Wards and Census Tracts

Property sales for the 1979 preliminary update were organized by Ward only. The link-relative method described above was used to extend the 1955-1975 Ward series and these are the figures shown in the tables and charts here.

Lacking a count of dwelling units for Boston Wards, we used instead the number of taxable residential properties as the basis for weighting and averaging Ward neighborhood RVI series to reach a Boston City Index. The count of residential properties (classes R1, R2, R3, and R4) is from the City Assessing Department fiscal year 1979 Class Recapitulation report.

The interpretation of the 1979 Boston composite RVI is consequently somewhat different from the interpretation for 1955-1975. For 1979 the Boston RVI reflects the average price increase shown by the typical Boston property. For the earlier years it reflects the average growth of prices for the typical dwelling unit. Since the Wards in which values grew most rapidly between 1975 and the first half of 1979 tend to be downtown neighborhoods where multi-family properties are most common, the weights used in 1979 probably result in a somewhat lower Boston Index than we would have obtained using housing unit weights. But this problem seems minor when compared to the "changed property" issue.

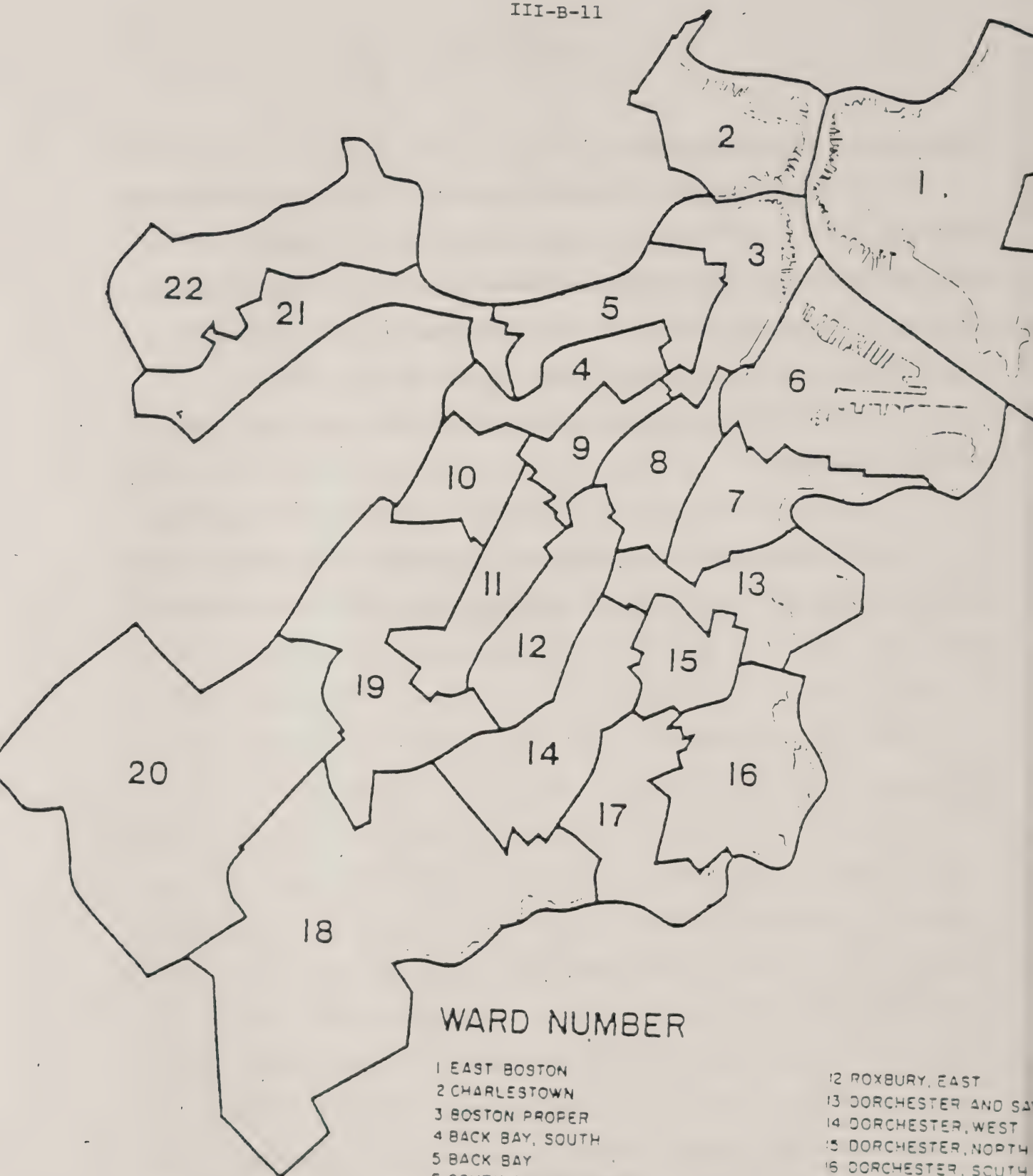
A Guide to the Tables and Graphs

The bottom line in the tables, marked "S74-79%", is the cumulative percentage change in the Index from 1974 to 1979. The "S" means that the 1974 Index value has been smoothed by taking the geometric mean of the 1973, 1974, and 1975 figures. This irons out chance year to year fluctuations while allowing for the steady growth that the RVI usually shows.

Wards 8 and 9 were processed together due to their small data bases and proximity.

A map is provided to show the Wards' locations and common names.

The accompanying graphs represent the average price changes between 1975 and 1979 as if value growth had occurred evenly over the intervening years.



WARD NUMBER

1 EAST BOSTON
2 CHARLESTOWN
3 BOSTON PROPER
4 BACK BAY, SOUTH
5 BACK BAY
6 SOUTH BOSTON, NORTH
7 SOUTH BOSTON, SOUTH
8 ROXBURY, EAST AND SOUTH
9 ROXBURY, CENTRAL
10 ROXBURY, WEST.
11. ROXBURY, SOUTH; EGLESTON SQUARE AND FOREST HILLS
12 ROXBURY, EAST
13 DORCHESTER AND SA
14 DORCHESTER, WEST
15 DORCHESTER, NORTH
16 DORCHESTER, SOUTH
17 DORCHESTER, CENTE
18 HYDE PARK AND MATT
19 JAMAICA PLAIN AND R
20 WEST ROXBURY, ROSL
21 BRIGHTON, SOUTH
22 BRIGHTON, NORTH

WARDS, CITY OF BOSTON

STON

AR	SALES	ASSESS	A/S
55	1.000	1.000	1.000
56	1.048	1.004	0.959
57	1.059	1.014	0.958
58	1.103	1.031	0.935
59	1.203	1.000	0.831
60	1.188	1.004	0.845
61	1.248	1.021	0.818
62	1.261	1.006	0.798
63	1.365	1.013	0.742
64	1.430	1.026	0.717
65	1.567	1.030	0.657
66	1.558	1.028	0.660
67	1.650	1.018	0.617
68	1.704	1.039	0.610
69	1.819	1.041	0.572
70	2.024	1.037	0.512
71	2.025	1.069	0.528
72	2.280	1.063	0.466
73	2.468	1.085	0.440
74	2.495	1.120	0.449
75	2.487	1.140	0.459
9	3.334	1.127	0.338
79%	+34.3%	+1.1%	

RD 2-Charlestown

AR	SALES	ASSESS	A/S
55	1.000	1.000	1.000
56	0.937	0.902	0.962
57	0.816	1.003	1.229
58	1.172	0.968	0.826
59	1.166	0.976	0.837
60	1.032	1.042	1.010
61	1.128	1.049	0.929
62	1.196	0.992	0.829
63	1.213	0.987	0.813
64	1.315	0.994	0.756
65	1.533	1.022	0.667
66	1.961	1.011	0.515
67	1.819	0.973	0.535
68	1.733	1.007	0.581
69	2.545	0.993	0.390
70	3.140	0.952	0.303
71	2.751	0.997	0.362
72	3.797	1.016	0.268
73	3.860	1.052	0.272
74	4.792	1.043	0.218
75	5.193	0.994	0.191
9	7.290	1.329	0.182
79%	+89.2%	+29.1%	

WARD 1- East Boston

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.067	1.017	0.953
1957	1.058	1.006	0.950
1958	1.144	1.006	0.879
1959	1.145	1.024	0.895
1960	1.106	1.009	0.912
1961	1.381	1.055	0.764
1962	1.234	1.011	0.819
1963	1.385	1.010	0.730
1964	1.526	1.016	0.666
1965	1.717	1.042	0.607
1966	1.611	1.024	0.635
1967	1.609	0.982	0.611
1968	1.869	0.988	0.529
1969	1.743	1.046	0.600
1970	2.241	1.031	0.460
1971	2.467	1.048	0.425
1972	2.801	1.042	0.372
1973	3.118	1.078	0.346
1974	3.370	1.115	0.331
1975	3.270	1.084	0.332
1979	4.237	1.120	0.264
574-79%	+30.3%	+2.5%	

WARD 3 - Downtown Neighborhoods

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	0.896	1.063	1.185
1957	1.695	1.034	0.610
1958	1.407	1.069	0.760
1959	1.673	0.866	0.518
1960	1.934	1.047	0.541
1961	1.573	0.939	0.597
1962	1.774	0.958	0.540
1963	1.607	1.081	0.673
1964	1.586	1.030	0.650
1965	1.803	1.027	0.569
1966	1.778	1.094	0.615
1967	2.486	1.055	0.424
1968	2.872	1.007	0.351
1969	2.930	1.058	0.361
1970	3.776	1.137	0.301
1971	2.970	0.962	0.324
1972	4.862	1.127	0.232
1973	4.466	1.247	0.279
1974	5.317	1.336	0.251
1975	4.629	1.481	0.320
1979	7.763	1.716	0.221
574-79%	+61.8%	+27.0%	

WARD 4 - Fenway- South End

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.205	1.112	0.923
1957	0.916	1.233	1.347
1958	1.003	1.316	1.312
1959	1.007	1.027	1.020
1960	0.892	1.019	1.143
1961	1.269	1.119	0.882
1962	1.041	1.116	1.071
1963	1.378	1.122	0.814
1964	1.334	1.144	0.858
1965	1.646	1.072	0.651
1966	2.039	1.038	0.509
1967	1.967	1.083	0.550
1968	2.194	1.214	0.553
1969	2.703	1.225	0.453
1970	3.428	1.079	0.315
1971	3.315	1.502	0.453
1972	4.242	1.481	0.349
1973	4.325	1.508	0.349
1974	4.353	1.792	0.412
1975	4.272	2.094	0.490
1979	8.637	2.052	0.238
574-79%	+100.1%	+15.2 %	

WARD 5--Back Bay-Beacon Hill

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.151	0.993	0.863
1957	1.281	1.035	0.808
1958	1.208	1.101	0.911
1959	1.489	1.036	0.696
1960	1.579	1.079	0.683
1961	1.680	1.092	0.650
1962	1.816	1.091	0.601
1963	1.969	1.088	0.553
1964	2.208	1.125	0.509
1965	2.480	1.209	0.487
1966	2.442	1.274	0.522
1967	2.846	1.201	0.422
1968	2.793	1.239	0.444
1969	3.154	1.282	0.406
1970	3.731	1.315	0.352
1971	3.324	1.361	0.409
1972	3.596	1.376	0.382
1973	4.129	1.459	0.353
1974	3.679	1.520	0.413
1975	3.914	1.492	0.381
1979	7.384	1.634	0.221
574-79%	+89.2%	+9.7%	

WARD 6 - City Point-South Boston

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.023	0.983	0.961
1957	1.054	1.013	0.960
1958	1.169	0.977	0.836
1959	1.262	1.015	0.804
1960	1.413	1.003	0.710
1961	1.252	1.014	0.810
1962	1.303	1.001	0.768
1963	1.449	1.006	0.694
1964	1.492	0.998	0.668
1965	1.402	0.997	0.712
1966	1.639	1.017	0.621
1967	1.806	0.982	0.544
1968	2.032	1.021	0.502
1969	2.006	0.997	0.497
1970	2.108	1.016	0.482
1971	2.573	1.002	0.389
1972	2.468	0.968	0.392
1973	2.953	1.023	0.346
1974	3.025	1.031	0.341
1975	4.043	1.094	0.271
1979	4.291	1.041	0.243
574-79%	+29.8%	-0.7%	

WARD 7- Andrew Square-South Boston

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	0.816	1.295	1.587
1957	0.883	1.217	1.379
1958	0.923	1.123	1.217
1959	1.039	1.139	1.096
1960	0.948	1.147	1.210
1961	1.191	1.153	0.968
1962	0.937	1.166	1.245
1963	1.218	1.231	1.010
1964	1.210	1.179	0.975
1965	1.280	1.123	0.878
1966	1.316	1.232	0.936
1967	1.492	1.102	0.924
1968	1.497	1.107	0.739
1969	1.566	1.387	0.886
1970	1.617	1.114	0.689
1971	1.751	1.241	0.708
1972	2.156	1.302	0.604
1973	2.351	1.254	0.533
1974	2.452	1.266	0.516
1975	1.973	1.308	0.663
1979	3.249	1.555	0.479
574-79%	+44.5%	+21.9%	

WARD 8 & 9 - Roxbury { City Hospital / Madison Park

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	0.821	0.943	1.148
1957	0.766	1.011	1.319
1958	1.478	0.987	0.668
1959	1.347	0.976	0.725
1960	1.316	1.021	0.775
1961	0.597	1.089	1.824
1962	0.964	1.020	1.058
1963	0.887	1.037	1.169
1964	0.755	0.980	1.298
1965	1.039	0.963	0.927
1966	1.182	0.990	0.837
1967	1.235	1.015	0.822
1968	1.151	1.022	0.888
1969	1.451	0.977	0.674
1970	1.588	1.021	0.643
1971	1.657	0.946	0.571
1972	1.600	1.021	0.638
1973	1.544	1.009	0.653
1974	2.327	1.015	0.436
1975	1.426	0.969	0.680
1979	3.070	1.296	0.422
74-79%	+78.1%	+30.0%	

WARD 10 - Parker Hill-Roxbury

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.046	1.035	0.989
1957	0.920	0.986	1.072
1958	1.116	1.030	0.922
1959	1.372	0.987	0.719
1960	0.993	0.991	0.998
1961	1.306	0.994	0.761
1962	1.290	0.977	0.757
1963	1.608	0.992	0.617
1964	1.420	0.991	0.698
1965	1.207	0.991	0.821
1966	1.354	0.936	0.691
1967	1.316	0.963	0.732
1968	1.554	0.984	0.634
1969	1.467	0.990	0.675
1970	1.838	1.000	0.544
1971	1.546	0.966	0.624
1972	1.597	0.990	0.620
1973	1.960	1.065	0.544
1974	1.708	0.987	0.578
1975	1.462	0.994	0.680
1979	2.011	.981	0.488
74-79%	+18.4%	-3.3%	

WARD 11 - Roxbury-Egleston Square

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.232	0.999	0.811
1957	0.969	0.886	0.914
1958	1.237	0.979	0.791
1959	1.276	0.992	0.777
1960	1.110	0.957	0.863
1961	1.162	0.952	0.819
1962	1.323	0.992	0.750
1963	1.315	0.977	0.743
1964	1.368	0.998	0.729
1965	1.442	0.991	0.687
1966	1.348	0.961	0.713
1967	1.697	0.994	0.586
1968	1.381	1.003	0.726
1969	1.655	1.000	0.604
1970	1.337	0.949	0.710
1971	1.758	0.994	0.565
1972	1.529	0.985	0.644
1973	1.774	0.994	0.560
1974	1.619	1.027	0.634
1975	1.533	1.001	0.653
1979	2.272	.981	0.432
74-79%	+38.6%	-2.6%	

WARD 12 - Washington Park-Warren-Roxbury

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.236	0.989	0.800
1957	1.068	1.156	1.083
1958	1.078	0.973	0.902
1959	1.168	1.080	0.925
1960	1.052	0.783	0.745
1961	1.083	1.017	0.938
1962	1.302	1.061	0.815
1963	1.168	0.938	0.803
1964	1.370	0.971	0.709
1965	1.534	0.993	0.647
1966	1.016	0.909	0.894
1967	1.122	0.929	0.828
1968	1.357	0.878	0.647
1969	1.503	0.838	0.558
1970	1.678	0.794	0.473
1971	1.339	0.800	0.598
1972	1.653	0.815	0.493
1973	1.639	0.869	0.530
1974	1.626	0.854	0.525
1975	1.914	0.839	0.439
1979	1.709	.786	0.460
74-79%	-0.7%	-8.0%	

WARD 13- Dorchester {Savin Hill / Columbia}

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.215	1.059	0.872
1957	1.112	1.095	0.984
1958	1.347	1.067	0.792
1959	1.520	1.231	0.810
1960	1.477	0.944	0.639
1961	1.440	1.031	0.716
1962	1.494	1.109	0.742
1963	1.694	1.033	0.610
1964	1.582	0.994	0.628
1965	1.631	1.022	0.627
1966	1.710	1.038	0.607
1967	1.723	0.982	0.570
1968	1.630	1.155	0.709
1969	1.767	0.976	0.552
1970	1.367	1.002	0.733
1971	1.653	1.034	0.626
1972	1.792	0.975	0.544
1973	1.918	0.926	0.483
1974	1.997	0.981	0.491
1975	1.588	0.967	0.609
1979	2.085	.961	0.461
S74-79%	+14.2%	+0.3%	

WARD 14- Franklin Field-Dorchester

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.212	0.986	0.813
1957	1.097	0.967	0.881
1958	1.039	0.967	0.930
1959	1.234	0.971	0.787
1960	1.203	0.989	0.822
1961	0.967	1.040	1.076
1962	1.057	0.971	0.919
1963	1.053	0.936	0.889
1964	1.151	0.957	0.832
1965	1.323	0.990	0.749
1966	1.226	0.954	0.778
1967	1.235	0.994	0.805
1968	1.318	0.956	0.726
1969	1.264	0.961	0.760
1970	1.391	0.918	0.660
1971	1.208	0.955	0.791
1972	1.357	0.875	0.645
1973	1.296	0.862	0.665
1974	1.271	0.887	0.697
1975	1.270	0.875	0.689
1979	1.316	.806	0.612
S74-79%	+2.9%	-7.8%	

WARD 15-Ronan Park-Dorchester

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	0.951	0.933	0.981
1957	1.122	1.021	0.910
1958	1.400	1.005	0.718
1959	1.252	0.997	0.797
1960	1.426	1.024	0.718
1961	1.307	0.971	0.743
1962	1.139	0.953	0.836
1963	1.497	0.977	0.653
1964	1.387	1.000	0.721
1965	1.532	0.995	0.650
1966	1.354	0.983	0.726
1967	1.344	1.017	0.757
1968	1.145	0.958	0.836
1969	1.341	0.881	0.657
1970	1.111	0.998	0.898
1971	1.187	1.014	0.855
1972	1.549	0.979	0.632
1973	1.419	0.984	0.694
1974	1.515	0.996	0.657
1975	1.387	1.052	0.758
1979	1.727	.958	0.555
S74-79%	-20.0%	-5.2%	

WARD 16 -Neponset-Dorchester

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	0.918	1.052	1.146
1957	1.077	1.040	0.966
1958	1.118	1.137	1.017
1959	0.912	1.100	1.206
1960	1.085	1.101	1.016
1961	1.110	1.073	0.967
1962	1.147	1.076	0.938
1963	1.235	1.171	0.948
1964	1.254	1.106	0.882
1965	1.335	1.110	0.832
1966	1.203	1.077	0.895
1967	1.463	1.044	0.714
1968	1.298	1.076	0.829
1969	1.426	1.087	0.762
1970	1.313	1.040	0.792
1971	1.372	1.090	0.795
1972	1.546	1.081	0.700
1973	1.660	1.070	0.644
1974	1.635	1.094	0.669
1975	1.605	1.103	0.687
1979	1.930	1.061	0.550
S74-79%	+18.2%	-2.6%	

RD 17 -Codman & Pierce Squares-Dor.

AR	SALES	ASSESS	A/S
55	1.000	1.000	1.000
56	1.066	0.995	0.934
57	1.141	1.002	0.878
58	1.144	1.000	0.875
59	1.435	1.005	0.700
60	1.461	0.974	0.667
61	1.422	0.998	0.702
62	1.381	0.990	0.717
63	1.638	1.008	0.615
64	1.482	0.984	0.664
65	1.675	1.016	0.606
66	1.662	1.013	0.610
67	1.543	1.014	0.657
68	1.877	0.983	0.523
69	1.616	1.001	0.619
70	1.492	0.987	0.662
71	1.723	1.009	0.586
72	1.639	0.996	0.608
73	1.753	1.000	0.571
74	1.781	1.004	0.564
75	1.702	1.004	0.590
79	2.338	.971	0.415
-79%	+34.0%	-3.2%	

WARD 18--Hyde Park

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.055	0.997	0.945
1957	1.129	0.946	0.839
1958	1.123	0.992	0.883
1959	1.216	1.002	0.824
1960	1.262	1.013	0.802
1961	1.276	1.005	0.788
1962	1.312	1.003	0.764
1963	1.388	1.022	0.736
1964	1.404	1.007	0.717
1965	1.509	1.010	0.669
1966	1.576	1.009	0.640
1967	1.511	1.017	0.673
1968	1.538	1.034	0.672
1969	1.661	1.016	0.611
1970	1.833	1.029	0.562
1971	1.769	1.045	0.591
1972	1.839	1.042	0.567
1973	1.969	1.033	0.524
1974	2.112	1.023	0.484
1975	1.986	1.026	0.516
1979	2.362	1.045	0.442
S74-79%	+16.9%	+1.7%	

RD 19 -Jamaica Plain-Roslindale

AR	SALES	ASSESS	A/S
55	1.000	1.000	1.000
56	1.070	0.963	0.900
57	1.155	0.951	0.824
58	1.143	0.967	0.846
59	1.123	0.945	0.842
60	1.147	0.995	0.867
61	1.301	0.952	0.732
62	1.271	0.967	0.761
63	1.358	0.980	0.722
64	1.402	0.961	0.685
65	1.399	0.976	0.697
66	1.506	0.944	0.627
67	1.495	0.933	0.624
68	1.444	0.979	0.678
69	1.566	0.973	0.621
70	1.673	0.978	0.584
71	1.707	0.963	0.564
72	1.805	0.980	0.543
73	2.022	0.965	0.477
74	2.023	0.960	0.475
75	2.091	0.970	0.464
979	2.405	1.002	0.417
4-79%	+17.6%	+3.8%	

WARD 20 -West Roxbury

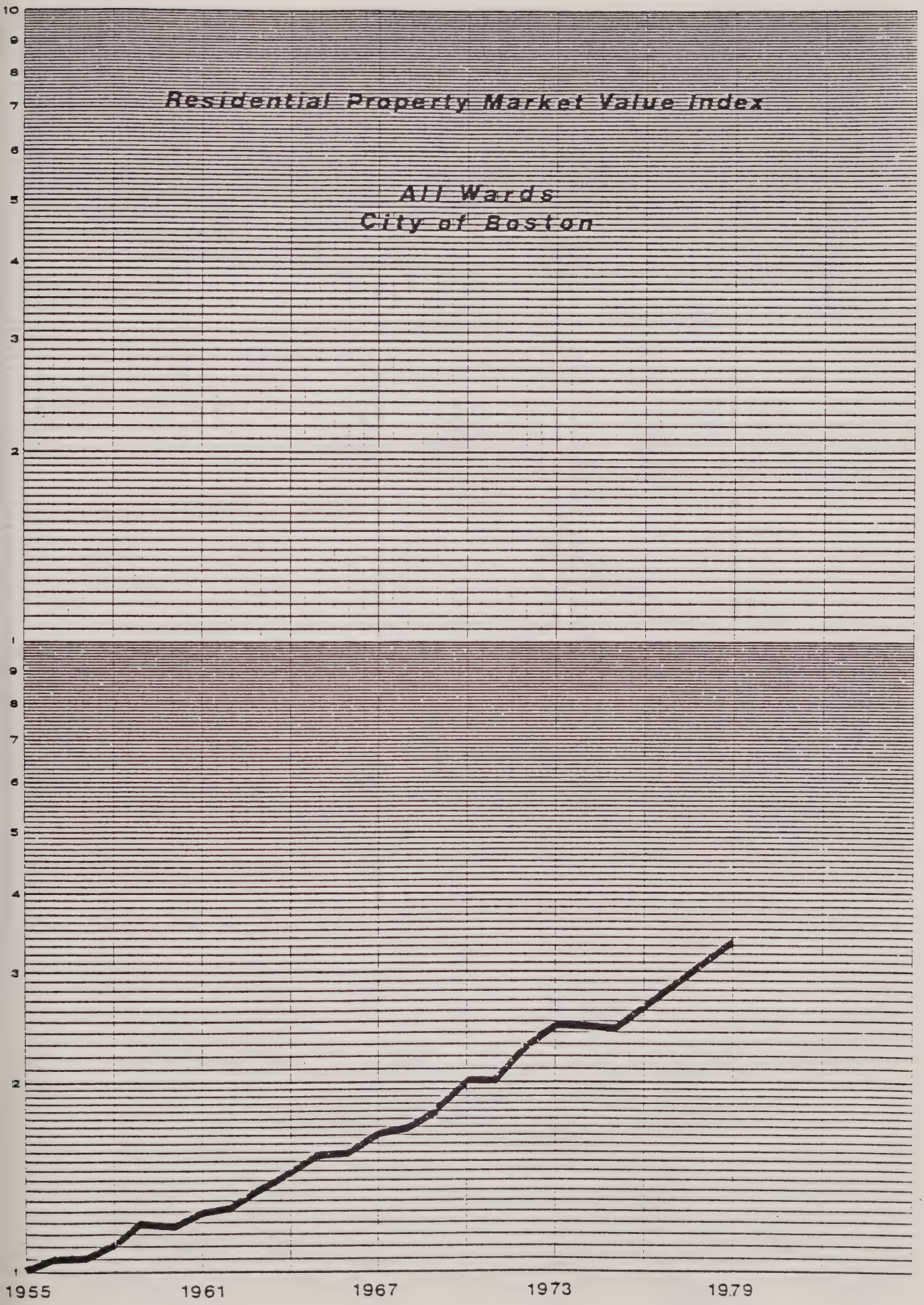
YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.051	0.978	0.930
1957	1.144	0.998	0.873
1958	1.187	0.968	0.815
1959	1.235	0.990	0.801
1960	1.178	0.963	0.817
1961	1.292	0.980	0.759
1962	1.293	0.974	0.753
1963	1.413	0.994	0.703
1964	1.486	0.985	0.663
1965	1.530	1.019	0.666
1966	1.543	0.987	0.639
1967	1.556	1.044	0.671
1968	1.599	1.020	0.638
1969	1.756	1.026	0.584
1970	1.886	1.046	0.555
1971	1.864	1.029	0.552
1972	2.040	1.017	0.499
1973	2.176	1.026	0.471
1974	2.278	1.030	0.452
1975	2.316	1.036	0.447
1979	3.327	1.069	0.321
S74-79%	+47.5%	+3.7%	

WARD 21 - Brighton, Comm. Ave.

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.186	1.086	0.915
1957	1.346	1.079	0.802
1958	1.282	1.073	0.837
1959	1.412	1.039	0.736
1960	1.475	0.976	0.662
1961	1.527	1.037	0.679
1962	1.441	1.040	0.722
1963	1.687	1.030	0.611
1964	1.661	1.051	0.633
1965	1.801	1.070	0.594
1966	1.844	1.098	0.595
1967	1.757	1.083	0.616
1968	1.858	1.026	0.553
1969	2.098	1.034	0.493
1970	2.194	1.046	0.477
1971	2.657	1.087	0.409
1972	2.694	1.040	0.386
1973	2.943	1.103	0.375
1974	3.125	1.288	0.412
1975	3.101	1.149	0.370
1979	4.013	1.499	0.374
S74-79%	+31.3%	+27.3%	

WARD 22 - Brighton, Allston

YEAR	SALES	ASSESS	A/S
1955	1.000	1.000	1.000
1956	1.131	1.019	0.901
1957	1.179	0.984	0.835
1958	1.211	1.017	0.840
1959	1.191	1.058	0.889
1960	1.288	0.999	0.776
1961	1.261	0.987	0.783
1962	1.353	1.002	0.741
1963	1.458	1.011	0.693
1964	1.514	0.995	0.657
1965	1.660	0.956	0.576
1966	1.591	0.995	0.626
1967	1.620	1.006	0.621
1968	1.857	0.987	0.532
1969	2.027	1.016	0.501
1970	2.232	1.034	0.463
1971	2.134	1.000	0.469
1972	2.415	0.939	0.389
1973	2.664	1.009	0.379
1974	2.766	1.081	0.391
1975	2.824	1.086	0.385
1979	3.755	1.018	0.271
S74-79	+36.5%	-3.8%	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All Wards
City of Boston
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9
8
7
6
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2
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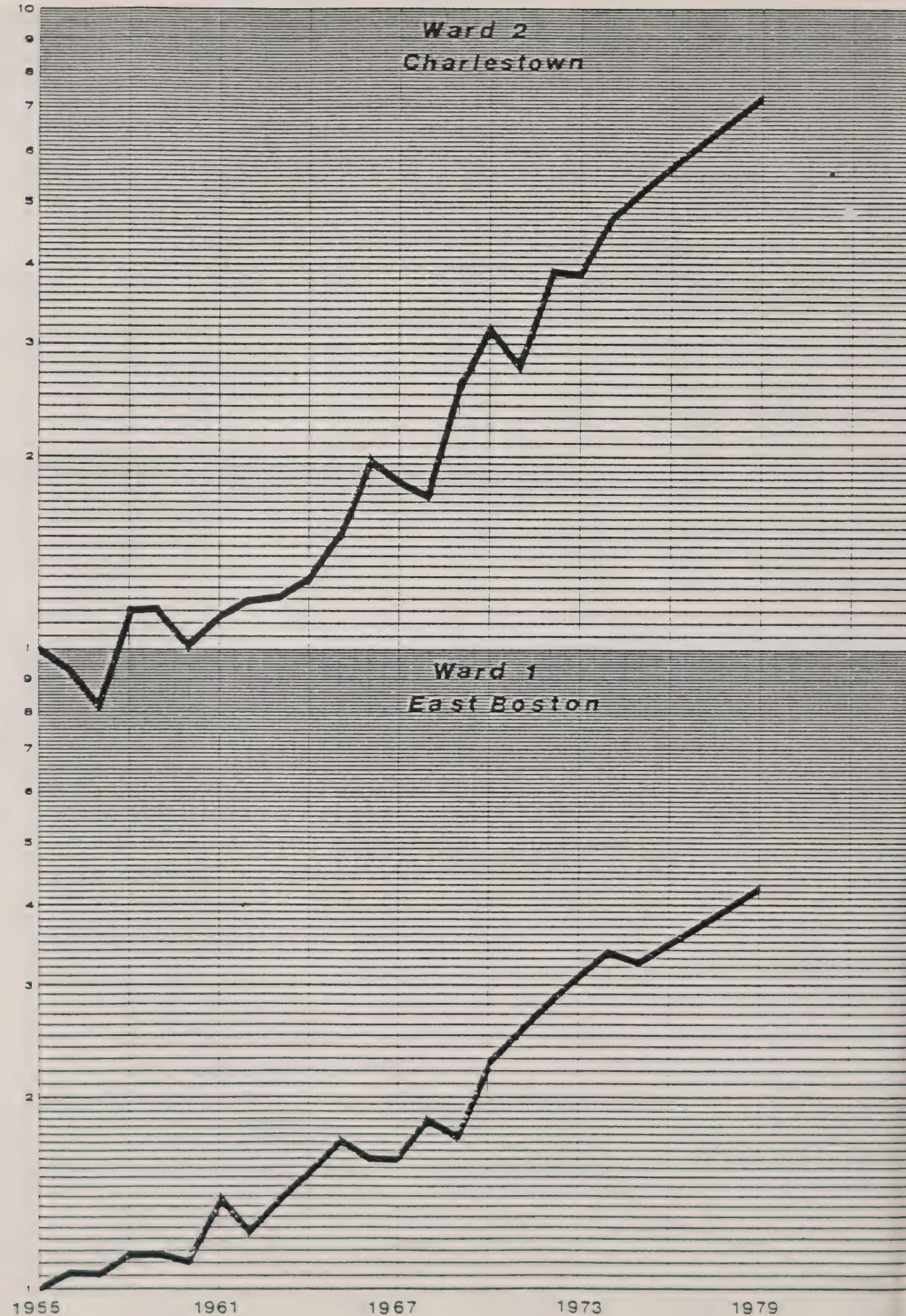
1955
1961
1967
1973
1979


Ward 2
Charlestown
Ward 1
East Boston
10
9
8
7
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4
3
2
1
1955
1961
1967
1973
1979
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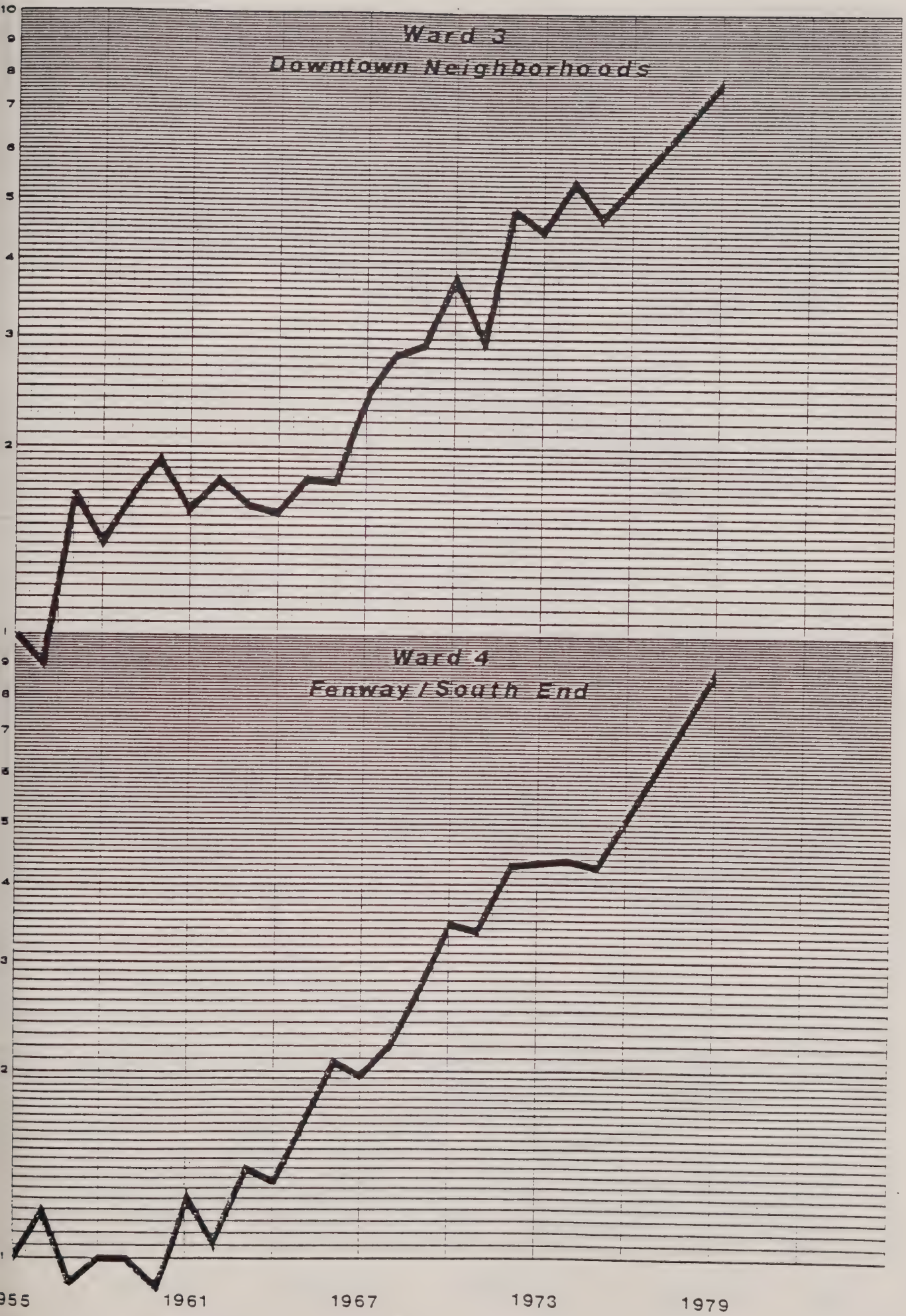
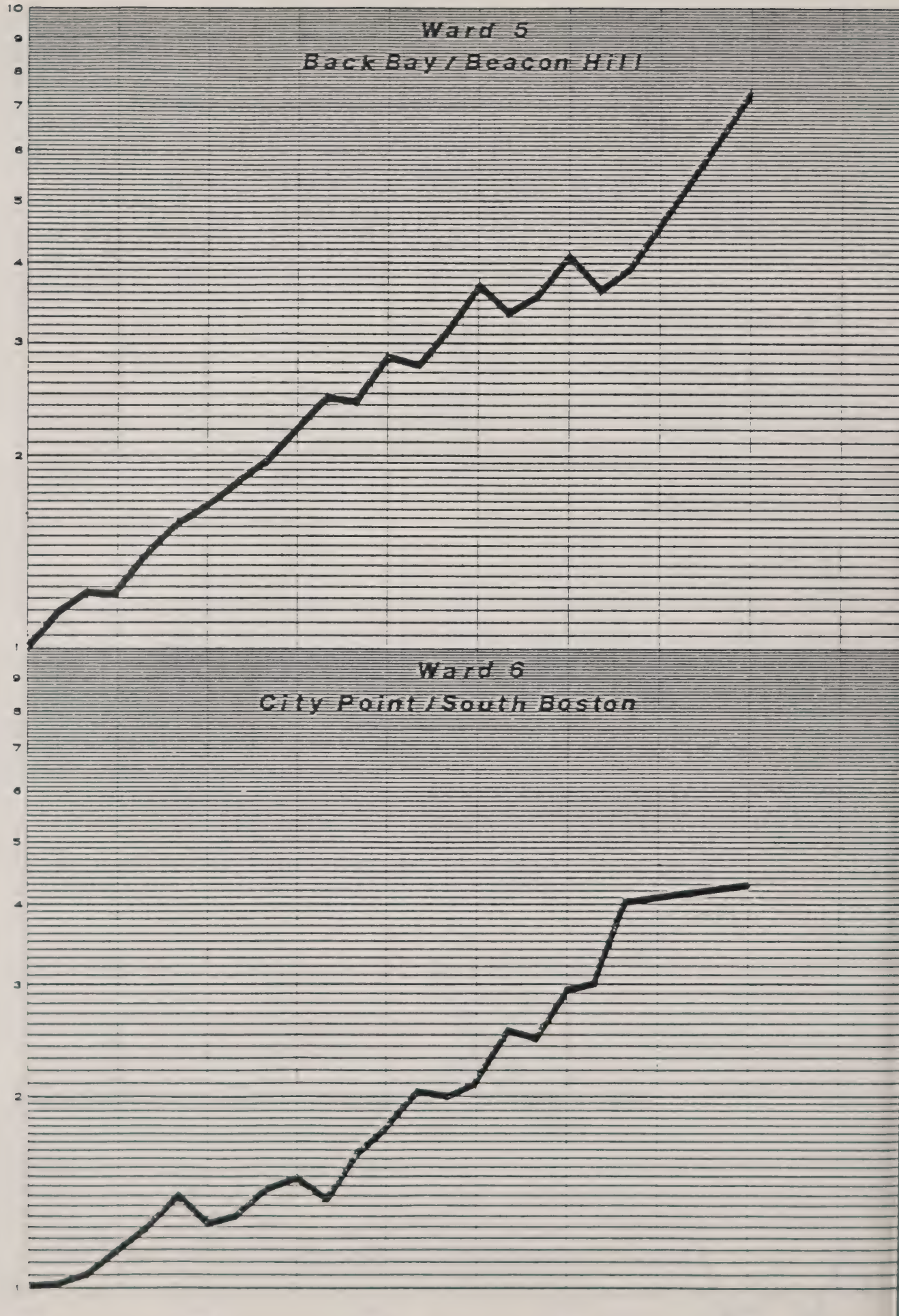
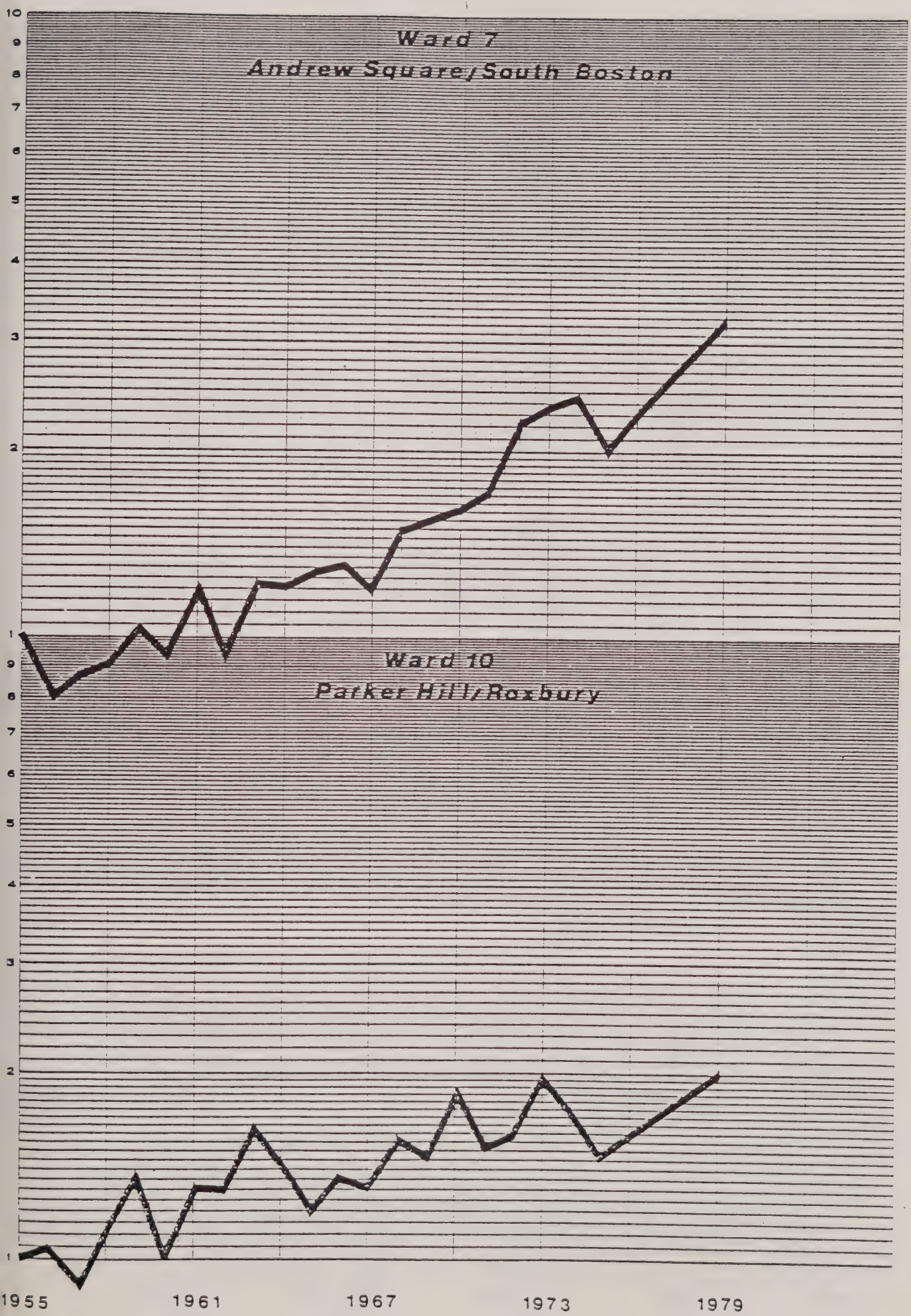

Ward 3
Downtown Neighborhoods
Ward 4
Fenway / South End
1955
1961
1967
1973
1979


Ward 5
Back Bay / Beacon Hill
Ward 6
City Point / South Boston
1955
1961
1967
1973
1979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9
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6
5
4
3
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1
Ward 10
Parker Hill/Roxbury
9
8
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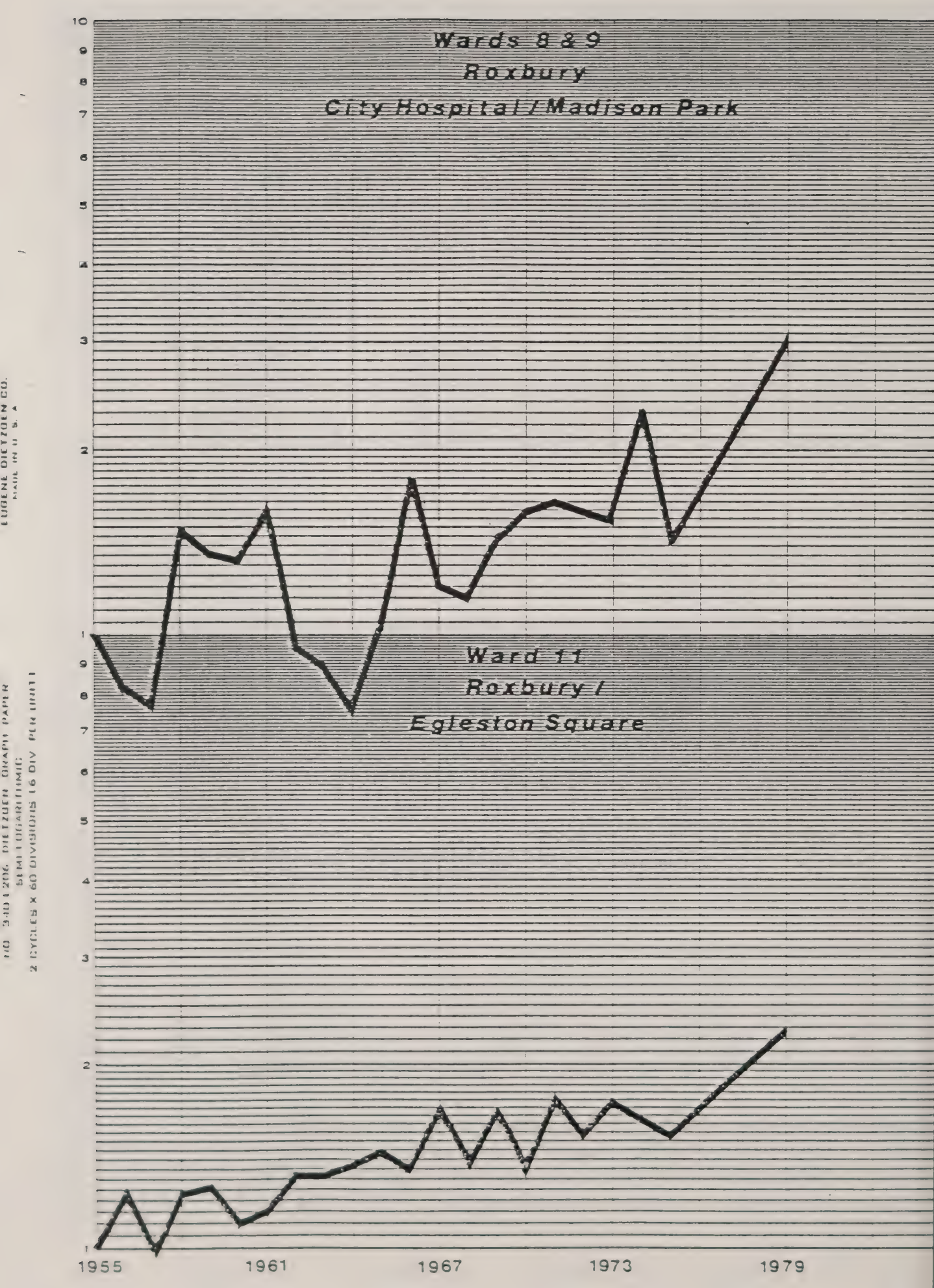
2
1
1955
1961
1967
1973
1979


Wards 8 & 9
Roxbury
City Hospital / Madison Park
Ward 11
Roxbury /
Egleston Square
10
9
8
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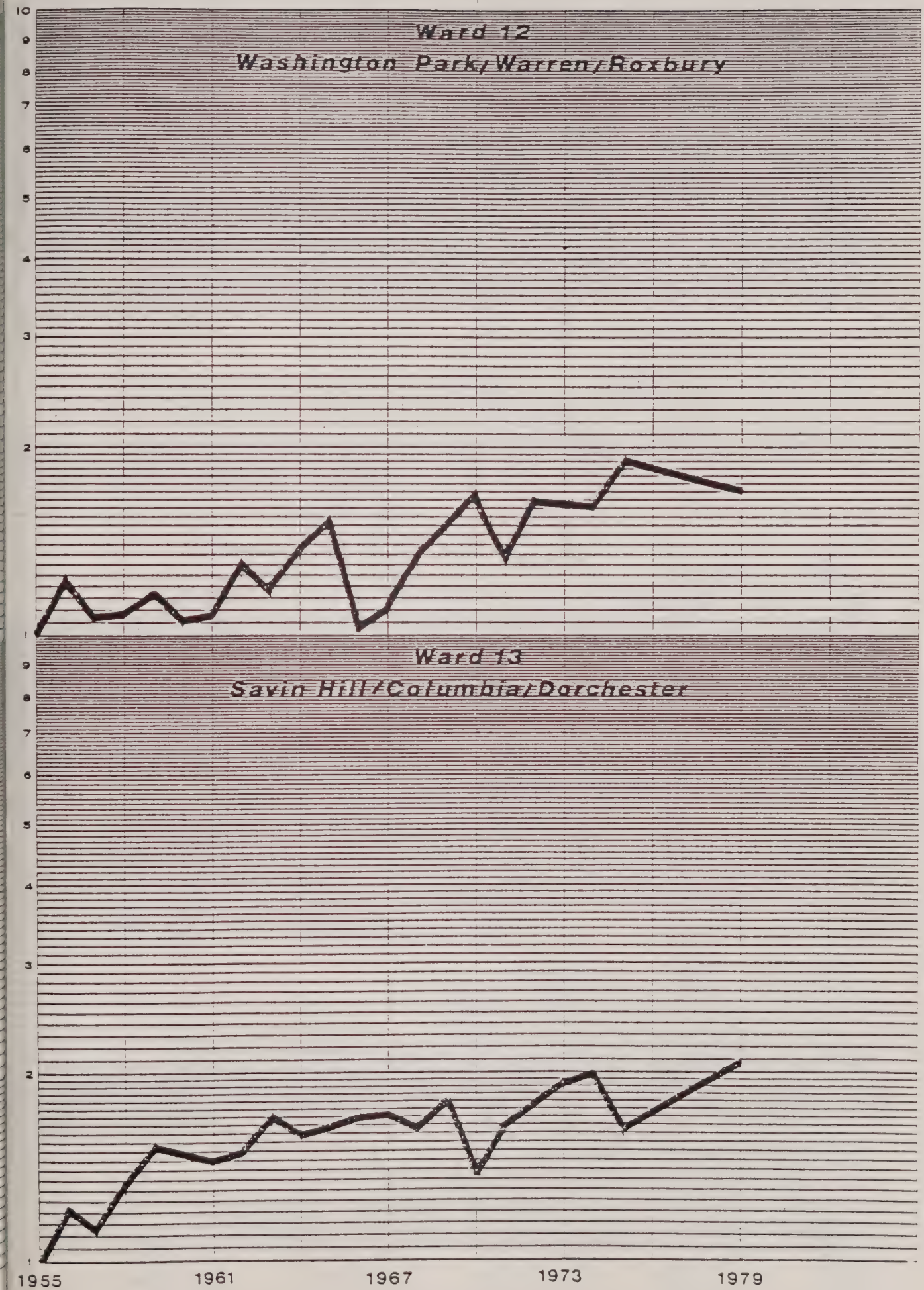
1955
1961
1967
1973
1979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Ward 13
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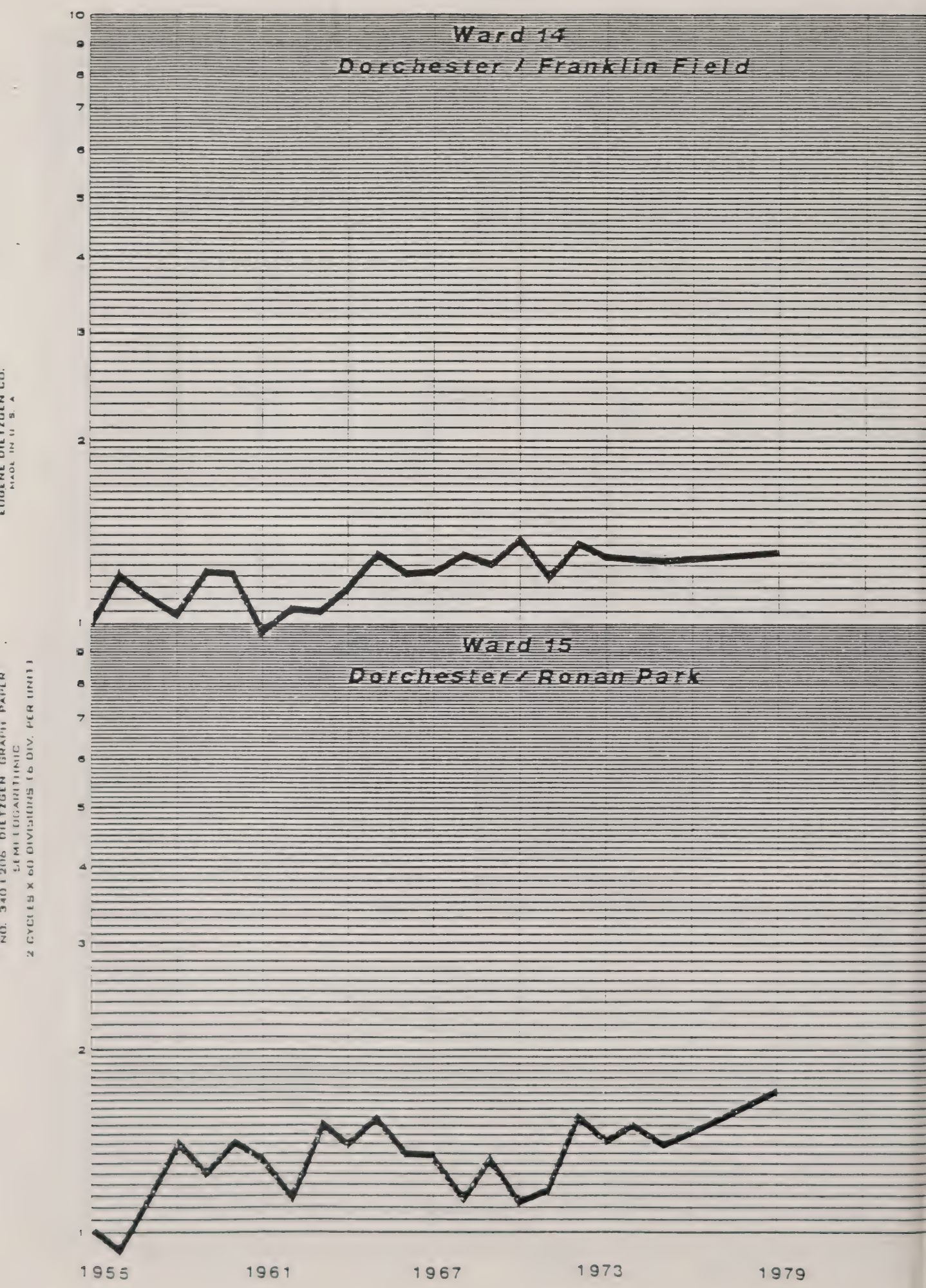
1955
1961
1967
1973
1979


Ward 14
Dorchester / Franklin Field
Ward 15
Dorchester / Ronan Park
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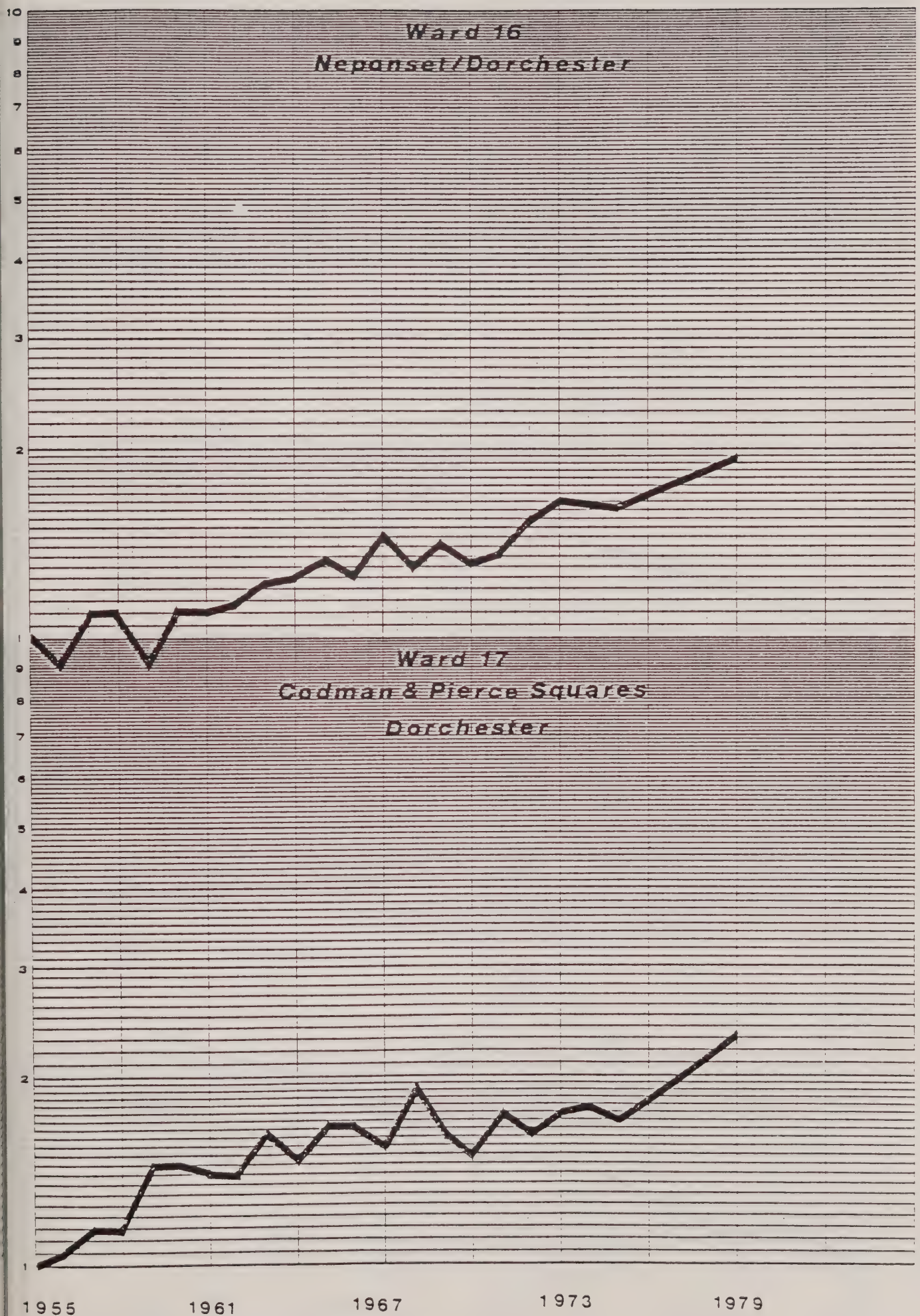
2
1
1955
1961
1967
1973
1979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Neponset/Dorchester
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3
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1
Ward 17
Codman & Pierce Squares
Dorchester
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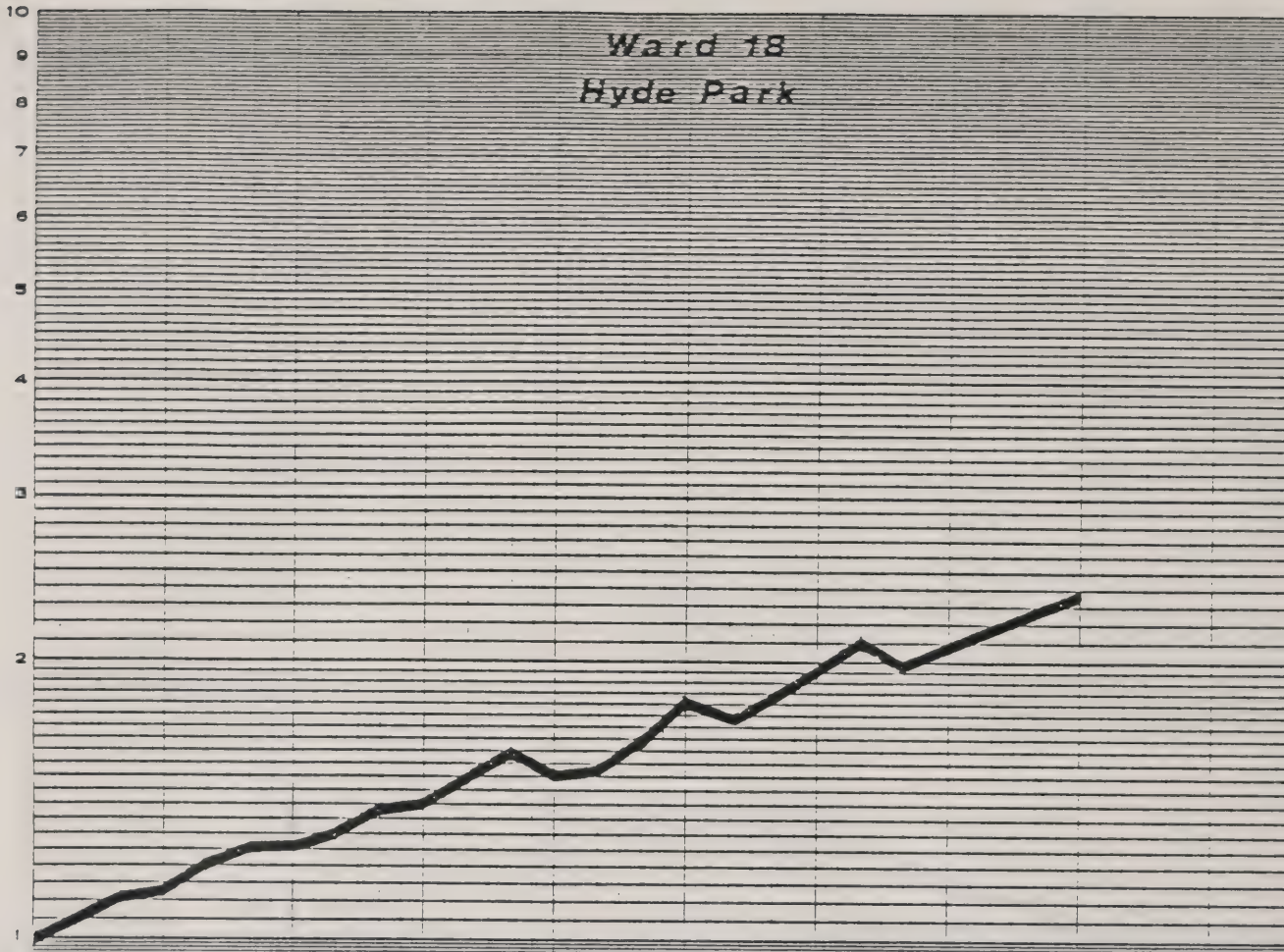
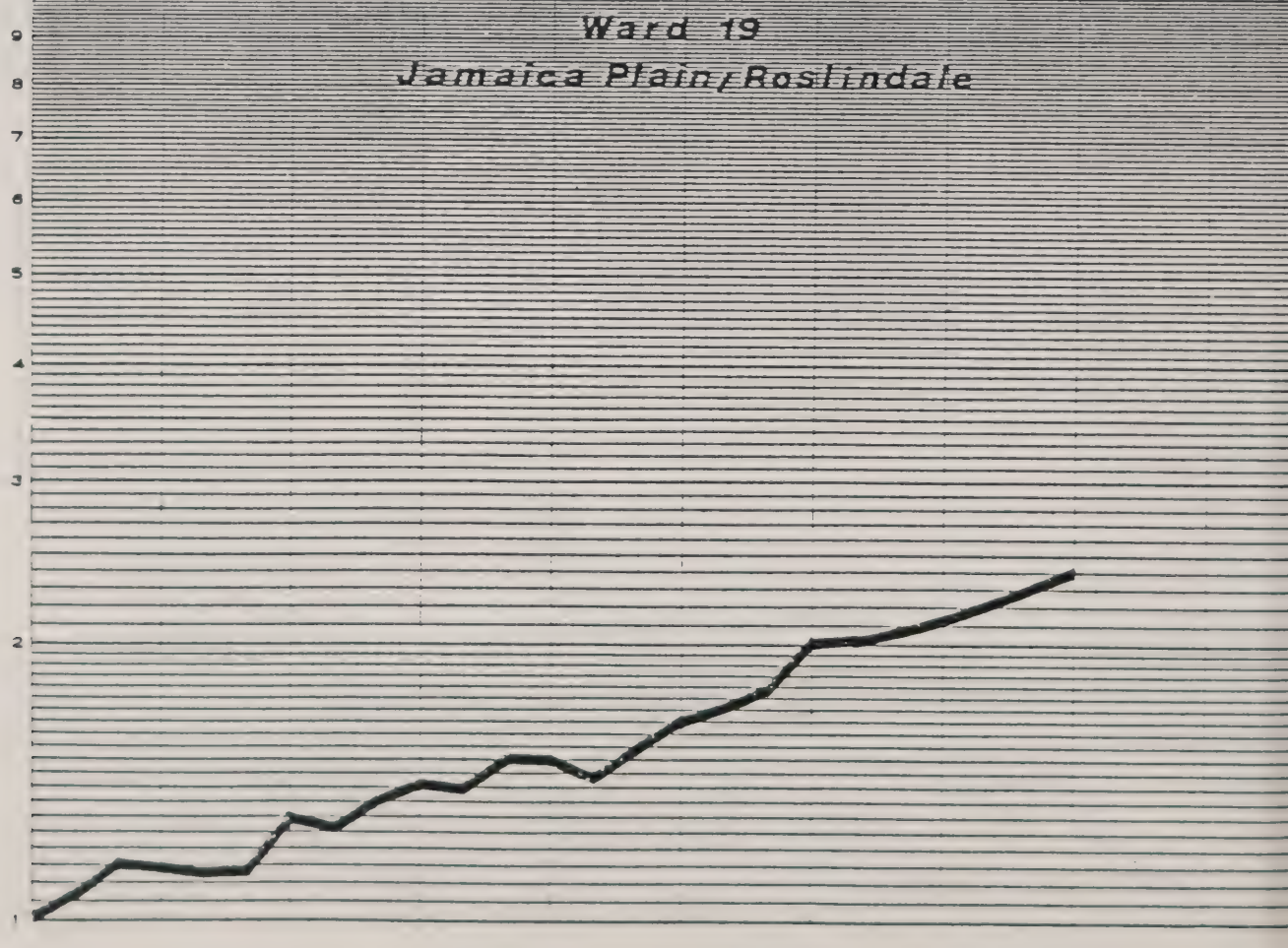
1955
1961
1967
1973
1979





1955 1961 1967 1973 1979

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EUGENE DIETZGEN CO.
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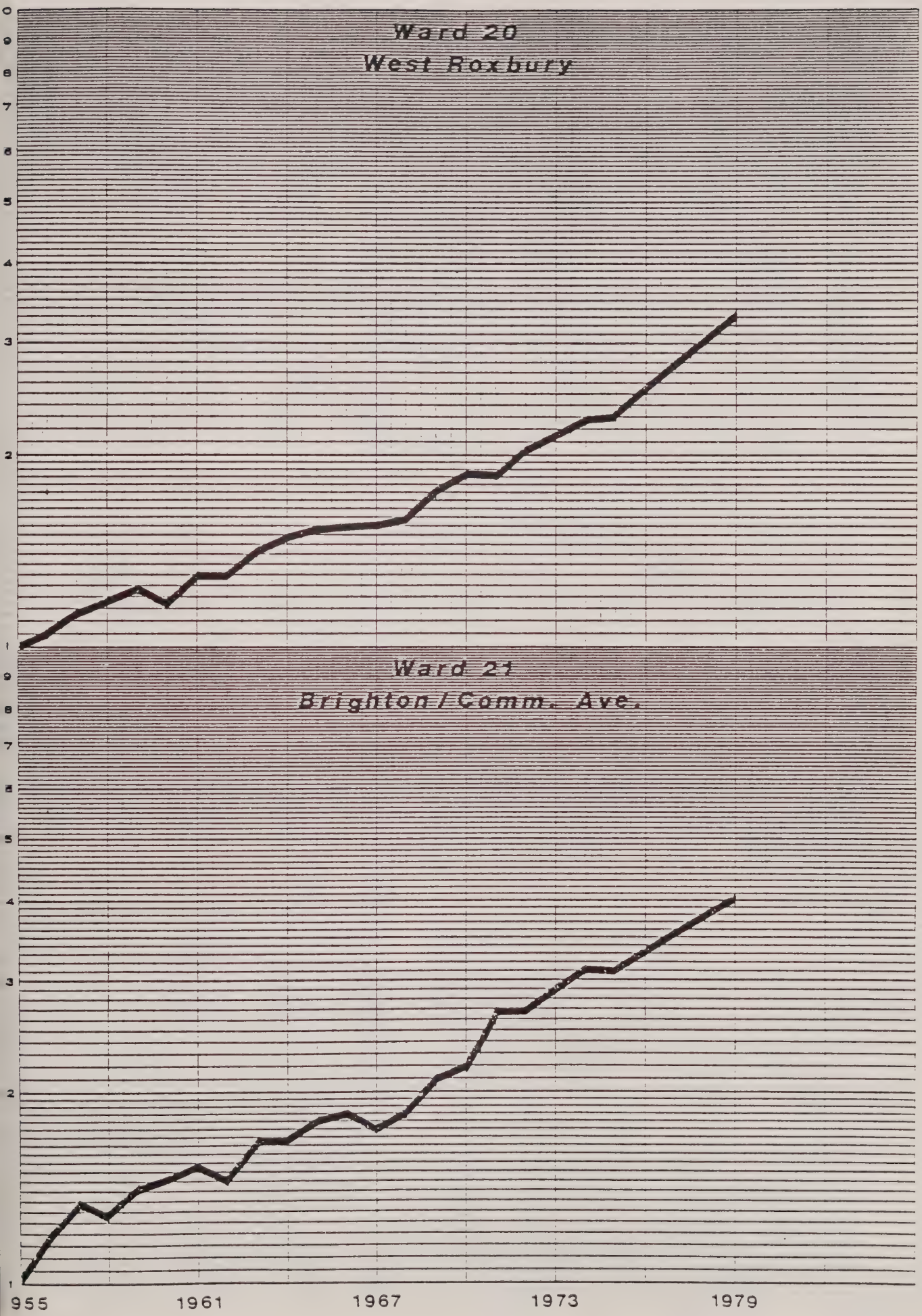
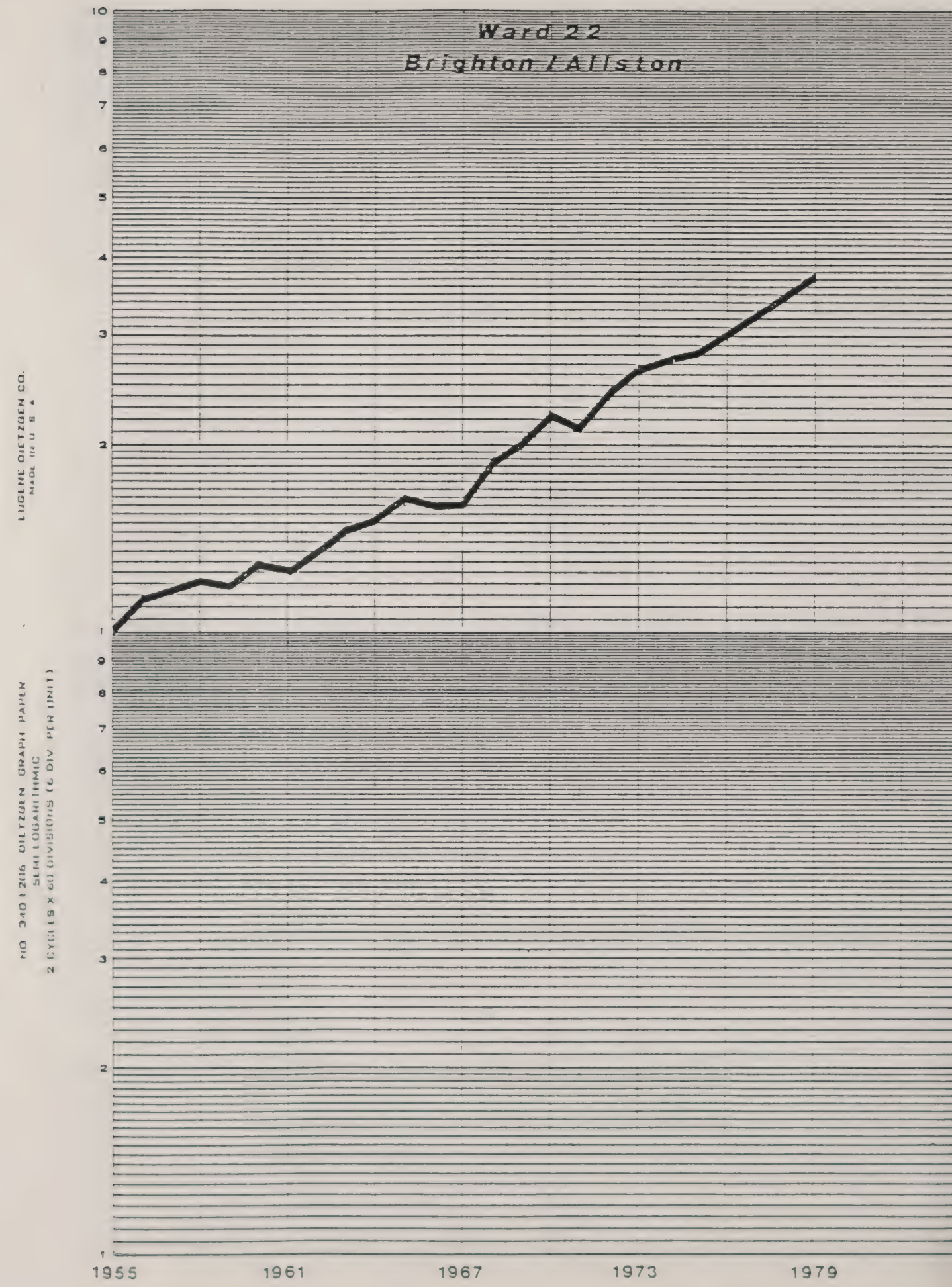

Ward 20
West Roxbury
Ward 21
Brighton / Comm. Ave.
1955
1961
1967
1973
1979


Ward 22
Brighton / Allston
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1955
1961
1967
1973
1979
EUGENE DIETZGEN CO.
MADE IN U.S.A.
NO 340 1206 DIETZGEN GRAPH PAPER
SEMI LOGARITHMIC
2 CYCLES X 60 DIVISIONS (6 DIV PER UNIT)

```
00050 OUR MAIN RAW DATA FILE
00060      PARTITIONED DATASET. ONE MEMBER:NEWART
00070      TYPE"ALLOCATE DA(WART.DATA(NEWART)) FILE($$$$)"
00080      WHERE "$$$$" IS THE NAME OF THE INPUT FILE USED IN PROGRAM
00090          CONTAINS 4891 OBSERVATIONS,EACH WITH 12 ELEMENTS:
00100          PLANNING DISTRICT NUMBER(1-16),OBSERVATION NUMBER,YEAR OF FIRST
00110          SALE(LAST TWO DIGITS ONLY), YEAR OF LAST  SALE,FIRST PRICE(IN
00120          THOUSANDS), SECOND PRICE, FIRST ASSESSMENT, SECOND ASSESSMENT,
00130          PROPERTY CODE(C=CONDO.),NUMBER OF UNITS,WARD, CENSUS TRACT.
00140                   1955 - 1975
00150                USED BY PVAL.VSBASIC AND SWORT.VSBASIC
00160                     **ERRORS**
00170                        OBS.#1,966: YEAR ONE SHOULD BE 57, NOT 37
00180                        OBS.#3,395: NUMBER OF UNITS SHOULD BE 80, NOT 5
00190
00200 INX79.DATA
00210     522 OBSERVATIONS: SALES PAIRS WITH SECOND SALE IN THE FIRST HALF
00220     OF 1979.... ORGANIZED BY WARD ONLY
00230     SEVEN DATA PER OBSERVATION: WARD NUMBER(1-22);YEAR OF FIRST
00240     SALE(LAST TWO DIGITS); PRICE FIRST YEAR(WHOLE DOLLARS); PRICE
00250     IN 1979; ASSESSMENT FIRST YEAR($); ASSESSMENT IN 1979; NUMBER
00260     OF DWELLING UNITS(CONDOS ENTERED AS .5)
00270            PROGRAM INX79X.VSBASIC READS THIS FILE AND WARBOS,
00280            WARBOA TO CALCULATE UPDATE BY "CHAIN-LINK" METHOD
00290
00300 LEWARFCO       LEWIS WHARF CONDO RESALES
00310    64 OBSERVATIONS,1973-1978, FIVE ELEMENTS/OBS.
00320    1) UNIT NUMBER 2)YEAR ONE(TWO DIGITS) 3)YEAR TWO  4)FIRST PRICE($)
00330     5)PRICE AT SECOND SALE
00340           PVAL3 DIGESTS FOR INDEXJ, CONDOBOP LISTS
00350
00360  BBBHCO     BACK BAY-BEACON HILL CONDOS
00370     61 OBSERVATIONS, 1971-1979, 5 ELEMENTS/OBS. AS IN LEWARFCO
00380           PVAL4.VSBASIC AND CONDOBOP.VSBASIC AS ABOVE
00390
00400 **********INTERMEDIATE AND SCRATCH FILES********
00410
00420   IPD1-IPD6        INTERMEDIATE MATRIX PUT BY PVAL TO FEED INDEXJ
00430
00440
00450 **********OUTPUT FILES**********************
00460 ALLBOSS
00470 ALLBOAA
00480 URBOS
00490 WARBOS
00500 WARBOA
00510 CENTBOS
00520 CENTBOA
00530 CENTNAME
00540 **********ANALYSIS PROGRAMS*****************
00550
00560 PVAL.VSBASIC     DIGESTS DATA FROM WART.DATA OR A SIMILAR FORMAT
00570                    FOR INDEXJ.  LIST LINES 5-55 FOR DESCRIPTION.
00580                        SELECTS FROM WART.DATA FOR 6 STUDY AREAS.
00590                        PRINTS TABLES DESCRIPTIVE OF EACH AREA'S DATA
00600                          OUTPUTS FILES IPD1-IPD6 FOR INDEXJ
00610
00620 PVAL3.VSBASIC      DIGESTS DATA FROM LEWARFCO.DATA FOR INDEXJ
00630
00640 PVAL4.VSBASIC      DIGESTS DATA FROM BBBHCO.DATA FOR INDEXJ
```

```
00660 CONDOBOP.VSBASIC  PRINTS TABLES DESCRIPTIVE OF LEWARFCO,
00670                    BBBHCO, OR SIMILAR DATA BASE
00680
00690 SWORT.VSBASIC        READS THROUGH WART.DATA AND PRINTS TABLES
00700                      DESCRIBING SAMPLE SIZE BY YEAR (NUMBER OF
00710                      FIRST SALES,SECOND SALES, TOTAL SALES).
00720
00730 INX79X.VSBASIC    PERFORMS "CHIAN LINK" UPDATE TO 1979 FROM
00740                  'INX79.DATA' AND WARBOS,WARBOA---BY WARD
00750
00760 INDEXJ.VSBASIC
00770 OUR PRIMARY INDEX PROGRAM
00780                    PERFORMS REGRESSION INDEX.
00790                    ACCEPTS INPUT FROM FILES IPD1-IPD6(OR
00800                    SIMILAR) PROVIDED BY PVAL, PVAL3, OR
00810                    PVAL4(OR SIMILAR).
00820                    LIST LINES 10-50 FOR A DESCRIPTION
00830                    OF OPTIONS.
00840                      ****CAUTION*****
00850                      OUTPUT FROM INDEXX(AN ANCESTOR)
00860                      PRIOR TO MAY 6,1980 REPORTED
00870                      INCORRECT LIST OF INDIVIDUAL RESIDUALS
00880                      AND WRONG DURBIN-WATSON.
00890
00900 INDEX.VSBASIC        IS AN EXACT COPY OF INDEXJ
00910
00920 **********LISTING AND TABLE PRINTING PROGRAMS*******
00930
00940  INXLSTA.VSBASIC LISTS BOSTON AND WARDS 1955-1979
END OF DATA
```

```
10 REM **** INDEXJ, REVISED 8.8.80.  J.A.
11 REM ***********************************************
20 REM ****  ALL-PURPOSE INDEX PROGRAM  DOES NOT OUTPUT RESULTS TO FILE
30 REM**** TO OUTPUT RESULTS(EXCLUDING BASE YEAR=1) TO A FILE NAMED "FILE", ADD THESE THREE LINES:
40 REM****         155 OPEN "FILE" IN     157 RESET "FILE" END         2005 PUT "FILE",EXP(Y(I))
41 REM **
42 REM *TO COMPUTE ASSESSMENT INDEX, CHANGE LINE 1800: CHANGE K9 TO D(I,2) AND THEN CHANGE D(I,2) TO K9
43 REM *THE LAST ITEM READ IN LINE 1800 IS THE DEP. VAR. FOR ASSESS.;SECOND LAST IS DEP.VAR. FOR SALES PRICE
44 REM **
45 REM ****** TO SELECT OR EXCLUDE A PROPERTY TYPE, USE LINES 1851-1859
46 REM ****** E.G. TO EXCLUDE CONDOS TYPE: 1855 IF K8=.5 GOTO 1800
47 REM ****** TO FURTHER SELECT ONLY PROPERTIES OF OVER 4 UNITS TYPE:1856 IF K8<4 GOTO 1800
48 REM **
49 REM CHECK ABOVE MENTIONED LINES TO ASSURE SPECIFICATIONS ARE CORRECT FOR YOUR PURPOSE
50 DIM X(32,32),A(32,32),C(32,32)
60 DIM Y(32),M(32),S(32),T(32),B(32),E(32),H(32)
70 DIM F$(8),A$(3)
80 DIM Q(700),D(700,34)
90 PRINT "HOW MANY INPUT FILES?"
100 INPUT Q9
110 PRINT USING 2110,"ENTER ONE FILENAME.    "
120 INPUT F$
130 OPEN F$ IN
140 Q8=Q8+1
150 IF Q8<>1 GOTO 1800
160 GOSUB 1620
170 FOR I = 1 TO T-1
180 E(I) = I+1
190 NEXT I
200 PRINT "  ***** PROPERTY VALUE REGRESSION ******"
210 PRINT
220 FOR I = 1 TO T+1
230 FOR J = 1 TO T+1
240 X=0
250 FOR L=2 TO N+1
260 X = X + D(L,I)*D(L,J)
270 NEXT L
280 X(I,J) = X
290 C(I,J) = X
300 NEXT J
310 T(I) = X(1,I)/X(1,1)
320 B(I) = 0
330 IF I = 1 THEN 350
340 B(I) = SQR(X(I,I)/(N-1) - X(1,I)**2/(N*(N-1)))
350 NEXT I
360 PRINT USING 2130,"INDEX","MEANS","STANDARD DEVIATIONS"
370 FOR I=1 TO T
380 M(I) = T(E(I)+1)
390 S(I) = B(E(I)+1)
400 PRINT USING 2140,E(I),M(I),S(I)
410 NEXT I
420 PRINT
430 FOR I = 1 TO T-1
440 Y(I) = C(E(I)+1,E(T)+1)
450 FOR J = 1 TO T-1
460 X(I,J) = C(E(I)+1,E(J)+1)
470 NEXT J
480 NEXT I
490 FOR I = 1 TO T-1
500 FOR J = 1 TO T-1
510 IF I <> J THEN 540
520 A(I,J) = 1
530 GOTO 550
540 A(I,J) = 0
```

```
550 NEXT J
560 NEXT I
570 FOR I = 1 TO T-1
580 IF X(I,I) < .000001 THEN 1380
590 Y(I) = Y(I)/X(I,I)
600 FOR J = 1 TO T-1
610 A(I,J) = A(I,J)/X(I,I)
620 IF J = I THEN 640
630 X(I,J) = X(I,J)/X(I,I)
640 NEXT J
650 X(I,I) = 1
660 FOR L = 1 TO T-1
670 IF L = I THEN 750
680 Y(L) = Y(L) - X(L,I)*Y(I)
690 FOR J = 1 TO T-1
700 A(L,J) = A(L,J) - X(L,I)*A(I,J)
710 IF J = I THEN 730
720 X(L,J) = X(L,J) - X(L,I)*X(I,J)
730 NEXT J
740 X(L,I) = 0
750 NEXT L
760 NEXT I
770 S6 = C(E(T)+1,E(T)+1)
780 FOR I = 1 TO T-1
790 S6 = S6 - Y(I)*C(E(I)+1,E(T)+1)
800 NEXT I
810 S7 = S6/(N+1-T)
820 R2 = ABS((MAX(0,1-S7))/(S(T)**2))
830 R3 = 1 - S6/(N*S(T)**2)
840 S8 = SQR(S7)
850 FOR I = 1 TO T-1
860 FOR J = 1 TO T-1
870 A(I,J) = A(I,J)*S7
880 NEXT J
890 NEXT I
900 IF P1 = 0 THEN 920
910 GOSUB 1420
920 PRINT
930 PRINT USING 2160,"INDEX","B","STD. ERROR","T-RATIO"
940 FOR I = 1 TO T-1
950 PRINT USING 2170,E(I),Y(I),SQR(A(I,I)),Y(I)/SQR(A(I,I))
960 NEXT I
970 PRINT
980 PRINT
990 I2=1-S6/R9
1000 I2=(I2*(N+1-T))/((1-I2)*(T-1))
1010 PRINT USING 2180,"F FROM I2(ADJUSTED) - ",I2,"R-SQUARED - ",R3
1020 PRINT USING 2190,"NUMBER OF OBS. - ",N,"NUMBER OF INDEP VAR - ",T-1
1030 PRINT USING 2200,"STAND.ERROR OF EST. - ",S8,"D.F. - ",(N+1-T)
1040 F6 = (R3/T)/((1-R3)/(N-T-1))
1050 PRINT USING 2210,"SUM SQ. RESID. - ",S6,"F =",F6
1060 GOSUB 1920
1070 FOR I=2 TO N+1
1080 Z=D(I,E(T)+1)
1090 FOR J=1 TO T-1
1100 Z = Z - Y(J)*D(I,E(J)+1)
1110 NEXT J
1120 Q(I) = Z
1130 NEXT I
1140 W9 = 0
1150 FOR I=3 TO N+1
1160 W9 = W9 + (Q(I) - Q(I-1)*(Q(I) - Q(I-1)))
1170 NEXT I
```

```
1250 PRINT
1260 PRINT USING 2100,"ACTUAL","PREDICTED","RESIDUAL","RES/PRED","OBSERVATION"
1270 I = 1
1280 I = I + 1
1290 IF P3=2 GOTO 1330
1300 W6 =D(I,E(T)+1)
1310 PRINT USING 2090,EXP(W6),EXP(W6-Q(I)),EXP(W6)-EXP(W6-Q(I)),(EXP(W6)-EXP(W6-Q(I)))/EXP(W6-Q(I)),I-1
1320 GOTO 1340
1330 PRINT USING 2090,D(I,E(T)+1),D(I,E(T)+1)-Q(I),Q(I),Q(I)/(D(I,E(T)+1)-Q(I)),I-1
1340 IF I = N+1 THEN 1360
1350 GOTO 1280
1360 PRINT
1370 GOTO 1390
1380 PRINT "CORRELATION MATRIX BECOMING SINGULAR"
1390 PRINT
1400 PRINT "    *****PROBLEM COMPLETED******"
1410 GOTO 2230
1420 REM *****VAR - COVAR MATRIX PRINTING SUBROUTINE **************
1430 PRINT "          VARIANCE - COVARIANCE MATRIX"
1440 PRINT
1450 F8 = 1
1460 FOR I=1 TO T-1
1470 F9 = 1
1480 FOR J=F8 TO T-1
1490 PRINT USING 2150,A(I,J)
1500 F9 = F9 + 12
1510 IF F9 = 73 THEN 1530
1520 NEXT J
1530 PRINT
1540 F7 = J
1550 NEXT I
1560 PRINT
1570 IF F7 = T-1 THEN RETURN
1580 F8 = F7 + 1
1590 GOTO 1460
1600 RETURN
1610 REM ***** DATA INPUT SUBROUTINE *********************************
1620 PRINT USING 2110, "ENTER # OF TIME PERIODS, STARTING YEAR AND INTERVAL, E.G. 30,1946,1"
1630 INPUT T,H(1),I7
1640 FOR J = 2 TO T
1650 H(J) = H(1) + ((J-1)*I7)
1660 NEXT J
1670 PRINT USING 2110,"DO YOU WANT A VAR-COVAR MATRIX?   "
1680 INPUT A$
1690 IF A$ = "YES" THEN P1 = 1
1700 PRINT USING 2110,"DO YOU WANT RESIDUALS?   "
1710 INPUT A$
1720 IF A$ = "YES" THEN P2 = 1
1730 IF P2<>1 GOTO 1760
1740 PRINT USING 2110,'DO YOU WANT RESIDUALS TRANSLATED (1), OR RAW(2)'
1750 INPUT P3
1760 E(T) = 1
1770 H(T+1) = 99
1780 R9 = 0
1790 I = 2
1800 GET F$,K6,K7,K8,Z1,D(I,2),K9, EOF 1880, CONV 1880
1810 FOR J = 3 TO T+1
1820 GET F$,D(I,J),EOF 1880
1830 NEXT J
1840 D(I,1) = 1
1850 R9 = R9 + (D(I,2)**2)
1860 I = I + 1
```

```
1870 GOTO 1800
1880 IF Q8=Q9 GOTO 1900
1890 GOTO 110
1900 N=I-2
1910 RETURN
1920 PRINT
1930 PRINT
1940 PRINT "********************* PRICE INDICES *********************"
1950 PRINT
1960 PRINT USING 2080,"YEAR","INDEX","RANGE OF 95% CONFIDENCE INTERVAL"
1970 PRINT USING 2070,H(1),"-",H(2)-1,"1"
1980 FOR I = 1 TO T-1
1990 E2 = 2*SQR(A(I,I))
2000 PRINT USING 2060,H(I+1),"-",H(I+2)-1,EXP(Y(I)),EXP(Y(I)-E2),EXP(Y(I)+E2)
2010 NEXT I
2020 PRINT
2030 PRINT "************************************************************"
2040 RETURN
2050 FORM C,PIC(ZZ#),C,SKIP2
2060 FORM PIC(####),POS5,C,PIC(####),POS16,PIC(Z#.######),POS30,PIC(Z#.######),POS45,PIC(Z#.######),SKIP1
2070 FORM PIC(####),POS5,C,PIC(####),POS17,C,SKIP1
2080 FORM POS3,C,POS17,C,POS29,C,SKIP1
2090 FORM PIC(Z#.######),POS16,PIC(Z#.######),POS31,PIC(Z#.######),POS46,PIC(ZZZ#.###),POS62,PIC(ZZZ#),SKIP1
2100 FORM C,POS16,C,POS31,C,POS46,C,POS59,C,SKIP1
2110 FORM C
2120 FORM C,PIC(Z#)
2130 FORM C,POS12,C,POS26,C,SKIP1
2140 FORM POS2,PIC(Z#),POS12,PIC(Z#.######),POS30,PIC(Z#.######),SKIP1
2150 FORM POSF9,PIC(Z#.######)
2160 FORM C,POS12,C,POS27,C,POS43,C,SKIP1
2170 FORM POS2,PIC(Z#),POS11,PIC(Z#.######),POS28,PIC(Z#.######),POS43,PIC(Z#.######),SKIP1
2180 FORM C,POS24,PIC(ZZ.ZZZZ),POS36,C,POS58,PIC(Z#.######),SKIP1
2190 FORM C,POS22,PIC(ZZZ#),POS36,C,POS56,PIC(ZZZ#),SKIP1
2200 FORM C,POS24,PIC(Z#.######),POS36,C,POS57,PIC(ZZ#),SKIP1
2210 FORM C,POS24,PIC(Z#.######),POS36,C,POS57,PIC(ZZ#.######),SKIP1
2220 FORM C,POS26,PIC(ZZ.ZZZ),SKIP1
2230 END
END OF DATA
```

```
00005 REM 'PVAL.VSBASIC' PRODUCES BACKGROUND TABLES AND CREATES
00006 REM LINE 220 CONTROLS SELECTION BY PLANNING DISTRICT, WARD, OR CENSUS TRACT
00007 REM LINE 770 CONTAINS DISTRICT, WARD, OR TRACT NUMBERS
00008 REM LINE 780 CONTAINS OUTPUT FILE NAMES
00009 REM STANDARD VERSION DOES SIX(6) AREAS PER RUN
00010 REM A=SUM OF CONDOS,Z=PRICE OF CONDOS,L=SUM OF LODGING HOUSES,G=PRICE OF LODGING HOUSES,N=SUM OF SINGLE FAMILY HOMES,
00020 REM M=PRICE OF SINGLE FAMILY HOMES,P=SUM OF 2 TO 4 UNITS,Q=SUM OF PRICE/UNIT,F=SUM OF UNITS,V=SUM OF UNITS
00030 REM GREATER THAN 5,Y=SUM OF PRICE/UNIT, J=SUM OF UNITS
00040 REM ***D=DISTRICT,I=I.D.#,Y1 AND Y2=YEARS,P1 AND P2=PRICES,A1 AND A2= ASSESSMENTS,D$=TYPE,U=#UNITS,W=WARD,T=CENSUS TRACT
00050 REM ****R(A,B)=SUM A/S RATIOS,K(A,B)=SUM RATIOS SQUARED,B(A,B)=#FIRST SALES,E(A,B)=#SECOND SALES
00055 REM *********TO ACCESS 1955-1975 DATA TYPE: ALLOCATE DA(WART.DATA(NEWART)) FILE(FART)
00060 DIM C(6),G$(6)
00070 DIM H(21),R(21,6),K(21,6),B(21,6),E(21,6)
00080 DIM A(21,6),Z(21,6),L(21,6),G(21,6),N(21,6),M(21,6),P(21,6),Q(21,6),F(21,6),V(21,6),Y(21,6),J(21,6)
00090 READ MAT C
00100 READ MAT G$
00110 F$='FART'
00120 PRINT
00130 PRINT
00140 PRINT
00150 GET F$,D,I,Y1,Y2,P1,P2,A1,A2,D$,U,W,T,EOF 790
00155 IF Y1=37 THEN Y1=57
00156 IF T=103 & U=5 THEN U=80
00160 D1=0
00170 IF D$='C' THEN U=.5
00180 Y1=Y1-54
00190 Y2=Y2-54
00200 Y3=Y2-Y1
00210 FOR I=1 TO 6
00220 IF W=C(I) THEN D1=I
00230 NEXT I
00240 IF D1=0 GOTO 150
00250 REM ***** STATISTIC FILE *****
00260 X=LOG(P2/P1)
00270 X1=LOG(A2/A1)
00280 MAT H=(0)
00290 H(Y1)=-1
00300 H(Y2)=1
00310 PUT G$(D1),D,I,U,Y3,X,X1.
00320 FOR I=2 TO 21
00330 PUT G$(D1),H(I)
00340 NEXT I
00350 REM ***END STAT FILE***
00360 REM ****SUM FOR TABLES****
00370 R(Y1,D1)=R(Y1,D1)+A1/P1
00380 R(Y2,D1)=R(Y2,D1)+A2/P2
00390 K(Y1,D1)=K(Y1,D1)+(A1/P1)**2
00400 K(Y2,D1)=K(Y2,D1)+(A2/P2)**2
00410 B(Y1,D1)=B(Y1,D1)+1
00420 E(Y2,D1)=E(Y2,D1)+1
00430 IF U<>.5 GOTO 490
00440 A(Y1,D1)=A(Y1,D1)+1
00450 A(Y2,D1)=A(Y2,D1)+1
00460 Z(Y1,D1)=Z(Y1,D1)+P1
00470 Z(Y2,D1)=Z(Y2,D1)+P2
00480 GOTO 150
00490 IF D$<>'L' GOTO 550
00500 L (Y1,D1)=L(Y1,D1)+1
00510 L(Y2,D1)=L(Y2,D1)+1
00520 G(Y1,D1)=G(Y1,D1)+P1
00530 G(Y2,D1)=G(Y2,D1)+P2
00540 GOTO 150
00550 IF U<>1 GOTO 610
```

```
00560 N(Y1,D1)=N(Y1,D1)+1
00570 N(Y2,D1)=N(Y2,D1)+1
00580 M(Y1,D1)=M(Y1,D1)+P1
00590 M(Y2,D1)=M(Y2,D1)+P2
00600 GOTO 150
00610 IF U>1 & U<5 GOTO 630
00620 IF U>=5 GOTO 700
00630 P(Y1,D1)=P(Y1,D1)+1
00640 P(Y2,D1)=P(Y2,D1)+1
00650 Q(Y1,D1)=Q(Y1,D1)+P1
00660 Q(Y2,D1)=Q(Y2,D1)+P2
00670 F(Y1,D1)=F(Y1,D1)+U
00680 F(Y2,D1)=F(Y2,D1)+U
00690 GOTO 150
00700 V(Y1,D1)=V(Y1,D1)+1
00710 V(Y2,D1)=V(Y2,D1)+1
00720 Y(Y1,D1)=Y(Y1,D1)+P1
00730 Y(Y2,D1)=Y(Y2,D1)+P2
00740 J(Y1,D1)=J(Y1,D1)+U
00750 J(Y2,D1)=J(Y2,D1)+U
00760 GOTO 150
00770 DATA 1,2,5,7,8,12
00780 DATA 'IPD1','IPD2','IPD3','IPD4','IPD5','IPD6'
00790 REM ***PRINT TABLES
00800 REM Z3=SUM OF ALL SALES,M1=MEAN,S=ST. DEV.
00810 FOR D1=1 TO 6
00820 PRINT USING 1190,'WARD',C(D1)
00830 PRINT USING 1170,"YEAR","AVER. A/S","ST.DEV.","N","SALE1","SALE2","SUM.SQ. A/S"
00840 FOR I=1 TO 21
00850 Z3=B(I,D1)+E(I,D1)
00855 IF Z3=0 THEN M1=0 ELSE 860
00856 GOTO 861
00860 M1=R(I,D1)/Z3
00861 IF Z3<3 THEN S=0 ELSE 870
00862 GOTO880
00870 S=SQR(((K(I,D1)/Z3-(R(I,D1)/Z3)**2))*Z3/(Z3-1))
00880 PRINT USING 1180,I+1954,M1,S,Z3,B(I,D1),E(I,D1),K(I,D1)
00890 B5=B(I,D1)+B5
00900 NEXT I
00910 PRINT USING 1190,"NUMBER OF OBSERVATIONS EQUALS",B5
00920 B5=0
00940 PRINT USING 1200," "
00970 PRINT USING 1210,"YEAR","LDG.HOUSES","SINGLE FAM.","2-4 UNITS","5+ UNITS","CONDOMINIUMS","TOTAL"
00980 PRINT USING 1220,"PRICE","PRICE","PRICE/UNIT","PRICE/UNIT","PRICE","PRICE/UNIT"
00990 PRINT USING 1230,"IMPUTES 5UNITS/L.H."
01000 REM Q4=PRICE OF 2-4UNIT/UNIT,Y4=PRICE OF 5+UNITS/UNIT,U2=TOTAL NUMBER OF BUILDINGS,U3=TOTAL NUMBER OF UNITS,T3=TOTAL PRICE,
01010 REM T4=TOTAL PRICE /UNIT
01020 FOR I=1 TO 21
01030 IF F(I,D1)=0 THEN Q4=0 ELSE Q4=Q(I,D1)/F(I,D1)
01040 IF J(I,D1)=0 THEN Y4=0 ELSE Y4=Y(I,D1)/J(I,D1)
01050 U2=A(I,D1)+L(I,D1)+N(I,D1)+P(I,D1)+V(I,D1)
01060 T3=Z(I,D1)+G(I,D1)+M(I,D1)+Q(I,D1)+Y(I,D1)
01070 U3=A(I,D1)+L(I,D1)*5+N(I,D1)+F(I,D1)+J(I,D1)
01071 IF N(I,D1)=0 THEN M(I,D1)=O ELSE 1079
01072 GOTO 1080
01079 M(I,D1)=M(I,D1)/N(I,D1)
01080 IF L(I,D1)=0 THEN G(I,D1)=0 ELSE 1090
01081 GOTO 1091
01090 G(I,D1)=G(I,D1)/L(I,D1)
01091 IF A(I,D1)=0 THEN Z(I,D1)=0 ELSE 1100
01092 GOTO 1110
01100 Z(I,D1)=Z(I,D1)/A(I,D1)
01110 IF U3=0 THEN T4=0 ELSE T4=T3/U3
01120 PRINT USING 1240,I+1954,Q(I,D1),Y4,U2,U3,T3,T4
```

```
01150 PRINT USING 1200,' '
01155 PRINT USING 1205,' '
01160 NEXT D1
01170 FORM POS1,C,POS7,C,POS19,C,POS31,C,POS35,C,POS44,C,POS56,C,SKIP
01180 FORM POS1,PIC(####),POS8,PIC(#.####),POS19,PIC(#.####),POS30,PIC(ZZ#),POS36,PIC(ZZ#),POS45,PIC(ZZ#),POS57,PIC(Z#.####),SKIP
01190 FORM C,POS36,PIC(ZZZ#),SKIP3
01200 FORM C,SKIP3
01205 FORM C,SKIP8
01210 FORM C,POS7,C,POS21,C,POS34,C,POS47,C,POS62,C,POS79,C,SKIP
01220 FORM POS8,C,POS24,C,POS34,C,POS46,C,POS65,C,POS76,C,SKIP
01230 FORM POS76,C,SKIP
01240 FORM PIC(####),POS6,PIC(ZZ#.##),POS12,C,POS13,PIC(Z#),POS15,C,POS19,PIC(ZZ#.##),POS25,C,POS26,PIC(Z#),POS28,C,POS33,PIC(Z#.##)
,POS38,C,POS39,PIC(Z#),POS41,C
01250 FORM POS46,PIC(Z#.##),POS51,C,POS52,PIC(Z#),POS54,C,POS61,PIC(ZZ#.##),POS67,C,POS68,PIC(Z#),POS70,C,POS78,PIC(ZZ#.##),POS84,C,
POS85,PIC(ZZ#),POS88,C,SKIP
01260 END
READY
```

Chapter IV

THE FISCAL AND ECONOMIC CONTEXT FOR REDUCING THE ROLE OF THE PROPERTY TAX

Selected Background Papers

	Page
Making Proposition 2½ Work Through Statewide Revenue Reform	IV-1
Boston's Recent Fiscal History (Fiscal Accounts Analysis)	16
The "Lottery" Formula for State Aid Distribution	44

John Avault
BRA Research Dept.
March 23, 1982

MAKING PROPOSITION 2½ WORK THROUGH STATEWIDE REVENUE REFORM

Introduction

The goals of meeting the Proposition 2½ mandate to reduce property taxes, maintaining desired levels of public service and protection, and reviving local capital improvement programs throughout the state require new revenue sources to replace lost property tax receipts and guarantee the repayment of new bonded debt. Massachusetts cities' and towns' need for reliable own revenue from new sources is especially urgent over these next few years of absolute property tax levy reductions called for by Proposition 2½.

The sales tax reforms proposed here are a means to make "2½" work in the long run by providing local governments with a reliable source of annual replacement revenue to maintain services and facilities in the face of declining real property tax receipts. Inflation will cause property tax rates and the purchasing power of property tax levies to fall even after formal levy reductions have ended. The growing bases of the tax on services, meals, and retail sales would offset declining rates for local property taxes and enable localities to meet their responsibilities for public services, protection, and education, while making steady progress toward lower property tax rates. The limited term emergency payroll tax is intended to assure the permanence of the sales tax solution by putting municipal finance on a firm footing through remedy of the growing fixed cost dilemma of unfunded pension liability.

Both parts of this proposal are well suited to the distribution of needs arising from the implementation of Proposition 2½. Employment and trade centers that serve commuter populations and that contribute to the Commonwealth's economic vitality are among those hit hardest by 2½. Giving these communities a share of "growth" tax bases would alleviate imbalances arising from the changing structure of the Massachusetts economy, which relies increasingly on human rather than presently taxable property capital. These reforms will also promote greater efficiency in public-private cooperation by making economic growth profitable rather than costly to cities and towns.

Broadening the Sales Tax Base

Massachusetts ranks 41st among the fifty states in its reliance on the sales tax. One reason for this is the narrowness of the tax base, which excludes food, clothing, medicine, alcohol, gas, cigarettes, and services. The exclusion of services is especially significant since the

service sector is a large and growing part of the Massachusetts economy. Furthermore, most services tend to be discretionary items in consumers' budgets, unlike necessities such as food, clothing, and medicine. A tax on services would therefore be more sensitive to the health of household budgets since the tax can be postponed by postponing the purchase of a service.

Table 1 shows that a six percent excise on the listed services would yield over $450 million (1981 constant dollars) in Massachusetts for FY83. The U.S. Bureau of Economic Analysis projects an average annual inflation adjusted growth rate of 3.1 percent for this group of services, and tax yields would grow accordingly. Boston, the city most impacted by Proposition 2½, is the site of 30.2 percent of this economic activity and would realize $138 million in FY83 under this plan which returns revenues to the place of origin. See Table 2. This is 26.7 percent of Boston's FY81 (pre-2½) property tax levy and almost offsets the projected $144 million combined property tax loss from the first two years of 2½. Detailed data are not available for most other Massachusetts communities, but if Lynn's share of tax receipts were equal to its share of all service industries in the state (0.7%), then its FY83 tax receipts would be $3.2 million or six percent of its pre-2½ property levy.

Background and derivation for the service sector tax estimates are presented in the Appendix.

Raising the Sales Tax Rate on the Present Base

In fiscal year 1981, Massachusetts' five percent sales tax on the currently limited base yielded $860 million of revenue for the state government. Table 3 details these revenues by type of sale and indicates the approximate percent of these collections taking place in the cities of Boston and Lynn. Raising the rate one point to six percent and returning the new revenues to the community of origin, as proposed above for the selected services sales tax, would provide over $182 million to the Commonwealth's cities and towns in FY 83, as shown in Table 4. Boston would receive nearly $19.8 million and Lynn almost $2.3 million. Inflation adjusted revenues would rise with real increases in the volume of retail trade, projected by the U.S. Bureau of Economic Analysis to be 2.9 percent annually through 1985 and 2.3 percent yearly between 1985 and 1990. By fiscal year 1984, Boston would enjoy over $6 million (1981 constant dollares) from the one percent levy on meals alone.

The Emergency Payroll Tax to Fund Pension Liability

Massachusetts is not the only state where unfunded public pension liability is referred to as "the time bomb of the '80s." Retirement costs represented eleven percent of Boston's FY80 budget appropriations, tied with Health and Hospitals for the second greatest appropriation after schools. Between fiscal year 1975 and 1980 Boston's net pension cost appropriations rose at an annually compounded rate of over twenty

percent. Legislation adopted in September, 1977 permits, but does not require, the advance funding of pension liabilities by cities and towns in the Commonwealth. Unless action is taken now, pensions will consume an ever-growing portion of dwindling municipal revenues and precipitate an inevitable fiscal crisis.

A one percent excise tax on private payrolls enacted for a five-year term with all proceeds earmarked for pension funding could defuse the time bomb. Table 5 shows the size and anticipated growth of the payroll tax base that would yield the revenues detailed in Table 6. Statewide receipts would grow from $355 million in FY83 to over $400 million in FY87 (1981 constant dollars). Returning these revenues to the community of origin would provide Boston with $402 million total over these five years and would give Lynn nearly $34 million (1981 constant dollars). The result would be a lowering of future municipal operating costs now financed through the property tax levy.

TABLE 1

TAX RECEIPTS FROM SELECTED SERVICE INDUSTRIES
MASSACHUSETTS, FISCAL YEARS 1983-1987
THOUSANDS OF 1981 DOLLARS

SIC	TYPE OF BUSINESS	1983	1984	1985	1986	1987
7011	HOTELS & MOTELS	33,854	35,113	36,420	37,774	39,180
721	LAUNDRY-LINEN & DRY CLEAN	14,066	14,407	14,757	15,116	15,483
722	PHOTO STUDIOS & PORTRAIT	2,543	2,604	2,668	2,733	2,799
723.4	BEAUTY & BARBER SHOPS	13,361	13,686	14,018	14,359	14,708
725	SHOE REPAIR & HAT CLEAN	573	587	601	616	631
729	TAX PREPARATION SERVICE *	664	680	697	714	731
729	MISC. PERSONAL SERVICES *	4,459	4,567	4,678	4,792	4,908
729	HEALTH CLUBS & SALONS *	1,528	1,565	1,603	1,642	1,682
731	ADVERTISING	9,301	9,527	9,759	9,996	10,239
732	CREDIT & COLLECTION *	1,151	1,179	1,208	1,237	1,267
7331	DIRECT MAIL ADVERT. *	3,261	3,340	3,421	3,504	3,589
7332.9	REPRO & PHOTOCOPY *	1,989	2,038	2,087	2,138	2,190
7333	COMM.PHOT-ART GRAPHIC *	5,330	5,531	5,739	5,954	6,178
734	SERVICES TO BLDGS	12,981	13,296	13,619	13,950	14,289
7361	EMPLOYMENT AGENCIES *	2,861	2,930	3,001	3,074	3,149
737	COMPUTER & DATA PROC.	29,275	29,986	30,715	31,461	32,226
7391	COMMERCIAL R & D *	17,482	17,907	18,342	18,780	19,244
7392	MANAGE. CONSULT. & P.R.	43,248	44,874	46,561	48,312	50,128
7393	ARMORED CAR SERVICES *	933	956	979	1,003	1,027
7393	ALARM SERVICES *	1,141	1,169	1,197	1,227	1,256
7393	DETECTIVE & GUARD *	6,252	6,404	6,559	6,719	6,882
7394	EQUIPMENT RENT & LEASING	11,007	11,275	11,549	11,829	12,117
7395	PHOTOFINISHING LABS *	3,949	4,045	4,143	4,244	4,347
7397	COMMERCIAL TESTING LABS *	1,459	1,495	1,531	1,568	1,606
7399	SIGN PAINTING SHOPS *	173	177	181	186	190
7399	PHONE ANSWERING SERVICE *	934	956	980	1,003	1,028
7399	WATER SOFTEN SERVICE *	117	120	122	125	128
7399	PACKAGING & LABELING *	645	661	677	693	710
7399	OTHER BUSINESS SERVICE *	8,752	8,965	9,183	9,406	9,635
7399	INTERIOR DESIGN *	1,246	1,276	1,307	1,339	1,372
751	AUTO RENTAL & LEASING	13,166	13,486	13,814	14,150	14,493
752	AUTO PARKING	2,470	2,530	2,591	2,654	2,719
753	AUTO REPAIR SERVICE	34,935	36,283	37,684	39,138	40,649
754	AUTO SERVICE - NOT REPAIR	2,398	2,456	2,516	2,577	2,639
76	MISC. REPAIR SERVICE	20,970	21,479	22,001	22,536	23,084
781.2	MOTION PICT. DIST. & PROD.	5,908	5,998	6,089	6,181	6,275
783	MOTION PICTURE THEATER	7,415	7,527	7,642	7,758	7,876
792	THEAT. PROD. & BANDS	4,274	4,339	4,405	4,472	4,540
793	BOWLING & BILLIARDS	3,167	3,281	3,400	3,522	3,649
7941	PROF. SPORTS CLUBS *	4,485	4,646	4,814	4,987	5,166
7948	RACING & RACETRACKS *	4,734	4,905	5,081	5,264	5,454
7992	GOLF COURSES - NOT MUNI.	1,048	1,086	1,125	1,165	1,207
7996	AMUSEMENT PARKS *	1,433	1,484	1,538	1,593	1,651
7997	MEMB. SPORTS & REC. CLUBS *	3,874	4,013	4,158	4,307	4,462
81	LEGAL SERVICES	55,568	57,657	59,825	62,074	64,408
891	ENG.- ARCH. & SURVEY.	57,385	59,543	61,782	64,105	66,515
	TOTAL	457,764	472,032	486,768	501,988	517,710

Sources: Derived from Table A5. Taxes are 6% of business receipts. Fiscal year business receipts are the average (geometric mean) of the two calendar years spanned. For instance, FY83 tax receipts are figured as 6% of the average of calendar years 1982 and 1983 business receipts.

TAX RECEIPTS FROM SELECTED SERVICE INDUSTRIES
BOSTON, FISCAL YEARS 1983-1987
THOUSANDS OF 1981 DOLLARS

SIC	TYPE OF BUSINESS	1983	1984	1985	1986	1987
7011	HOTELS & MOTELS	9,450	9,802	10,166	10,545	10,937
721	LAUNDRY-LINEN & DRY CLEAN	3,081	3,155	3,232	3,311	3,391
722	PHOTO STUDIOS & PORTRAIT	371	380	389	399	409
723.4	BEAUTY & BARBER SHOPS	1,795	1,839	1,883	1,929	1,976
725	SHOE REPAIR & HAT CLEAN	172	176	180	185	189
729	TAX PREPARATION SERVICE *	526	539	552	565	579
729	MISC. PERSONAL SERVICES *	1,248	1,279	1,310	1,342	1,374
729	HEALTH CLUBS & SALONS *	446	457	468	480	491
731	ADVERTISING	5,154	5,280	5,408	5,539	5,674
732	CREDIT & COLLECTION *	406	416	426	437	447
7331	DIRECT MAIL ADVERT. *	1,480	1,516	1,553	1,591	1,630
7332.9	REPRO & PHOTOCOPY *	730	748	766	785	804
7333	COMM.PHOT-ART GRAPHIC *	2,296	2,383	2,472	2,565	2,662
734	SERVICES TO BLDGS	3,986	4,083	4,182	4,284	4,388
7361	EMPLOYMENT AGENCIES *	918	941	964	987	1,011
737	COMPUTER & DATA PROC.	5,057	5,180	5,305	5,434	5,566
7391	COMMERCIAL R & D *	1,116	1,143	1,171	1,199	1,228
7392	MANAGE. CONSULT. & P.R.	7,543	7,827	8,121	8,426	8,743
7393	ARMORED CAR SERVICES *	272	279	286	293	300
7393	ALARM SERVICES *	333	341	350	358	367
7393	DETECTIVE & GUARD *	4,441	4,549	4,660	4,773	4,889
7394	EQUIPMENT RENT & LEASING	1,918	1,965	2,012	2,061	2,111
7395	PHOTOFINISHING LABS *	1,313	1,345	1,378	1,412	1,446
7397	COMMERCIAL TESTING LABS *	96	98	101	103	106
7399	SIGN PAINTING SHOPS *	48	49	50	51	52
7399	PHONE ANSWERING SERVICE *	118	121	124	127	130
7399	WATER SOFTEN SERVICE *	34	35	36	37	37
7399	PACKAGING & LABELING *	188	193	198	202	207
7399	OTHER BUSINESS SERVICE *	1,989	2,037	2,087	2,138	2,190
7399	INTERIOR DESIGN *	358	366	375	384	394
751	AUTO RENTAL & LEASING	5,584	5,720	5,859	6,001	6,147
752	AUTO PARKING	1,747	1,789	1,832	1,877	1,923
753	AUTO REPAIR SERVICE	3,879	4,028	4,184	4,345	4,513
754	AUTO SERVICE - NOT REPAIR	281	288	295	302	309
76	MISC. REPAIR SERVICE	3,186	3,264	3,343	3,424	3,507
781.2	MOTION PICT. DIST. & PROD.	3,113	3,161	3,209	3,258	3,307
783	MOTION PICTURE THEATER	2,603	2,642	2,682	2,723	2,764
792	THEAT. PROD. & BANDS	1,384	1,405	1,426	1,448	1,470
793	BOWLING & BILLIARDS	367	381	394	409	423
7941	PROF. SPORTS CLUBS *	3,283	3,401	3,524	3,650	3,782
7948	RACING & RACETRACKS *	0	0	0	0	0
7992	GOLF COURSES - NOT MUNI.	0	0	0	0	0
7996	AMUSEMENT PARKS *	0	0	0	0	0
7997	MEMB. SPORTS & REC. CLUBS *	111	115	120	124	128
81	LEGAL SERVICES	32,082	33,289	34,540	35,839	37,187
891	ENG.- ARCH. & SURVEY.	23,945	24,845	25,779	26,748	27,754
	TOTAL	138,451	142,849	147,393	152,089	156,943

Sources: Derived from Table A6. Taxes are 6% of business receipts. Fiscal year business receipts are the average (geometric mean) of the two calendar years spanned. For instance, FY83 tax receipts are figured as 6% of the average of calendar years 1982 and 1983 business receipts.

TABLE 3

	FY81 5% SALES TAX REVENUES ($1,000S) MASSACHUSETTS	1977 BUSINESS SHARES(%) BOSTON	LYNN
REGULAR	572,452	10.19	1.08
MEALS	155,496	17.85	1.01
AUTOS	132,127	5.49	2.33
TOTAL	860,075	10.85	1.26

SOURCES: FY81 REVENUES ARE REPORTED BY THE MASSACHUSETTS DEPARTMENT OF REVENUE. BUSINESS SHARES ARE DERIVED FROM THE 1977 CENSUS OF RETAIL TRADE.

TABLE 4

PROJECTED YIELD OF AN ADDITIONAL 1% SALES TAX LEVY BY PLACE OF ORIGIN (1981 CONSTANT $1,000 S)

FISCAL YEAR	MASSACHUSETTS				BOSTON				LYNN			
	REGULAR	MEALS	AUTO	TOTAL	REGULAR	MEALS	AUTO	TOTAL	REGULAR	MEALS	AUTO	TOTAL
1983	121,307	32,951	27,999	182,257	12,361	5,882	1,537	19,780	1,310	333	652	2,295
1984	124,866	33,918	28,820	187,604	12,724	6,054	1,582	20,360	1,349	343	672	2,363
1985	128,530	34,913	29,666	193,109	13,097	6,232	1,629	20,958	1,388	353	691	2,432
1986.	131,545	35,732	30,362	197,639	13,404	6,378	1,667	21,449	1,421	361	707	2,489
1987	134,631	36,570	31,074	202,275	13,719	6,528	1,706	21,953	1,454	369	724	2,547

SOURCES: YIELD ESTIMATES ARE DERIVED FROM TABLE 3 UNDER THE ASSUMPTION THAT ANNUAL INFLATION-ADJUSTED GROWTH IN RETAIL SALES WITHIN MASSACHUSETTS WILL BE 2.9% THROUGH 1985 AND 2.3% BETWEEN 1985 AND 1990 AS FORCASTED BY THE U. S. DEPT. OF COMMERCE BUREAU OF ECONOMIC ANALYSIS.

TABLE 5

PRIVATE PAYROLL: 1980 (CURRENT $1,000 S) AND PROJECTIONS 1981-1987 (1981 CONSTANT $1,000 S) FOR MASSACHUSETTS, BOSTON, AND LYNN

CALENDAR YEAR	MASSACHUSETTS	BOSTON	LYNN
1980	30,051,288	6,386,730	536,196
1981	33,854,777	7,195,077	604,061
1982	34,958,443	7,429,636	623,753
1983	36,098,088	7,671,842	644,087
1984	37,274,886	7,921,944	665,084
1985	38,490,047	8,180,200	686,766
1986	39,536,977	8,402,701	705,446
1987	40,612,382	8,631,255	724,634

THE 1980 PAYROLL FIGURES ARE TOTAL ANNUAL WAGES FOR PRIVATE EMPLOYERS COVERED BY THE MASS. DIVISION OF EMPLOYMENT SECURITY (SERIES ES-202). FEDERAL, STATE, AND LOCAL GOVERNMENT EMPLOYEES ARE NOT INCLUDED. REAL ANNUAL PAYROLL GROWTH OF 3.26% BETWEEN 1980 AND 1985 AND 2.72% BETWEEN 1985 AND 1987 IS ASSUMED (1980 OBERS; BEA REGIONAL PROJECTIONS). PAYROLL INFLATION 1980-1981 IS ASSUMED TO BE 9.1%

TABLE 6

YIELD OF A LOCALLY COLLECTED 1% PRIVATE PAYROLL TAX FOR MASSACHUSETTS, BOSTON, AND LYNN (1981 CONSTANT $1,000 S)

FISCAL YEAR	MASSACHUSETTS	BOSTON	LYNN
1983	355,237	75,498	6,338
1984	366,818	77,959	6,545
1985	378,776	80,500	6,758
1986	390,100	82,907	6,960
1987	400,711	85,162	7,150

FISCAL YEAR TAXES ARE CALCULATED AS THE AVERAGE (GEOMETRIC MEAN) OF YIELDS FROM THE TWO CALENDAR YEARS SPANNED. FOR EXAMPLE, FY83 TAXES ARE THE AVERAGE OF CALENDAR YEARS 1982 AND 1983 TAXES.

John Avault/Jeff Brown

Appendix

Method for Estimating Proposed Service Sector Tax Yields

The major steps in making these estimates are: 1) identify base year business receipts; 2) project sector growth rates and future business receipts; 3) convert calendar year figures to fiscal year; and 4) multiply by the proposed tax rate.

1) 1977 Business Receipts

While statewide Massachusetts figures are fairly complete, the available data from the 1977 Census of Retail Trade, 1977 Census of Selected Service Industries, and County Business Patterns (1977) do not provide a precise estimate of Boston's share of receipts in selected services in the state. Much data were either withheld or aggregated beyond the desired level of detail.

For 23 of the 46 service industries listed in Table A1, data on business receipts were available for both Massachusetts and Boston from the Census of Selected Service Industries. Note that figures for four of these industries include establishments with payroll only. Thus, the totals are slightly understated due to the exclusion of business receipts from proprietors.

For nine other service industries, Boston business receipts were not disclosed, but annual payroll data provide an indication of Suffolk County's share of state total payroll by industry. Taking 95 percent of the Suffolk payroll to represent Boston, Boston's share of total payroll in the State is a rough proxy for the City's share of total State receipts. Therefore, the payroll percentages in Table A2 were applied to the State receipts in Table A1 for these sectors identified by footnote "e" in Table A1.

In seven cases, neither Boston business receipts nor payroll amounts are available, but the number of business establishments in both Boston and Massachusetts were disclosed. Boston business receipts were, therefore, figured as a percent of Massachusetts receipts equal to the percent of the number of statewide establishments found in Boston. These are identified by footnote "f" in Table A1.

For five industries none of the above data were recorded for Boston, and so its share was estimated based on the City's share of the State business receipts for all selected service industries (29.2 percent) reported in the 1977 Census of Service Industries. For example, multiplying State business receipts in health clubs and salons by .292 would provide an estimate of Boston receipts in this industry. See footnote "h" of Table A1.

In two final cases (Racing and Racetracks and Amusement Parks) no data were disclosed for Boston, and receipts were assumed to be zero. These are labeled in Table A1 by footnote "g".

2 Projection of Business Receipts

Projections of business receipts in selected services were derived from projections of labor and proprietor's income published by the Bureau of Economic Analysis. Assuming that growth in labor and proprietors' income is closely related to growth in business receipts (in constant dollars), the forecasted compound annual growth rates 1978-1990 for selected services in Massachusetts (see Table A3 and the last column of Table A1) were applied to the 1977 Boston business receipts (in constant 1981 dollars).

This method would err toward understating Boston's receipts in future years if relative growth rates follow historic patterns for Boston, the Metropolitan Area and the State. Suffolk County's (of which Boston makes up about 95 percent in terms of earned income) compound annual growth rate 1967-1979 exceeded that of the SMSA and the State by nearly one percentage point (see Table A4). The BEA's forecasted growth rates have not been adjusted for this analysis; the likely faster growth in services in Boston makes the forecast for the City somewhat conservative.

Tables A5 and A6 extrapolate annual Massachusetts and Boston business receipts from Table A1 using the projected growth rates shown in Tables A1 and A3. The base year receipts were inflated to 1981 dollars using the the U.S. GNP deflator series.

3) Converting Calendar Years to Fiscal Years

The tables in this appendix are all in terms of January to December calendar years. State and local fiscal years run from July 1 through June 30. The fiscal year tax yield tables in the body of this report were calculated as the average of the two calendar years spanned. The average used is the geometric mean (square root of the multiplicative product for the two calendar years' figures) since this method of averaging is especially well suited to series that grow at steady compound rates.

TABLE A1

1977 BUSINESS RECEIPTS ($1,000S)
FOR SELECTED SERVICES
MASSACHUSETTS AND BOSTON

SIC	TYPE OF BUSINESS	MASSACHUSETTS	BOSTON	BOSTON AS % OF MASS.	FORECASTED ANNUAL GROWTH RATES(%)
7011	HOTELS & MOTELS	333,426	93,075	27.9	3.72
721	LAUNDRY-LINEN & DRY CLEAN	148,403	32,503	21.9	2.43
722	PHOTO STUDIOS & PORTRAIT	26,827	3,916 e	14.6	2.43
723.4	BEAUTY & BARBER SHOPS	140,968	18,939	13.4	2.43
725	SHOE REPAIR & HAT CLEAN	6,045	1,814	30.0	2.43
729	TAX PREPARATION SERVICE *	7,005	5,551 f	79.2	2.43
729	MISC. PERSONAL SERVICES *	47,041	13,171 fh	28.0	2.43
729	HEALTH CLUBS & SALONS *	16,122	4,708 h	29.2	2.43
731	ADVERTISING	98,134	54,384	55.4	2.43
732	CREDIT & COLLECTION *	12,147	4,287 f	35.3	2.43
7331	DIRECT MAIL ADVERT. *	34,403	15,619 e	45.4	2.43
7332.9	REPRO & PHOTOCOPY *	20,990	7,703 e	36.7	2.43
7333	COMM.PHOT-ART GRAPHIC *	52,387	22,568 e	43.1	3.76
734	SERVICES TO BLDGS	136,959	42,056	30.7	2.43
7361	EMPLOYMENT AGENCIES *	30,181	9,690	32.1	2.43
737	COMPUTER & DATA PROC.	308,872	53,352 f	17.3	2.43
7391	COMMERCIAL R & D *	184,451	11,773	6.4	2.43
7392	MANAGE. CONSULT. & P.R.	425,043	74,135 h	17.4	3.76
7393	ARMORED CAR SERVICES *	9,845	2,875 h	29.2	2.43
7393	ALARM SERVICES *	12,042	3,516	29.2	2.43
7393	DETECTIVE & GUARD *	65,963	46,857	71.0	2.43
7394	EQUIPMENT RENT & LEASING	116,135	20,236 e	17.4	2.43
7395	PHOTOFINISHING LABS *	41,662	13,858 e	33.3	2.43
7397	COMMERCIAL TESTING LABS *	15,395	1,014	6.6	2.43
7399	SIGN PAINTING SHOPS *	1,825	503 f	27.6	2.43
7399	PHONE ANSWERING SERVICE *	9,850	1,242 fh	12.6	2.43
7399	WATER SOFTEN SERVICE *	1,231	359 h	29.2	2.43
7399	PACKAGING & LABELING *	6,804	1,987 hf	29.2	2.43
7399	OTHER BUSINESS SERVICE *	92,345	20,987	22.7	2.43
7399	INTERIOR DESIGN *	13,147	3,772	28.7	2.43
751	AUTO RENTAL & LEASING	138,915	58,917	42.4	2.43
752	AUTO PARKING	26,056	18,427	70.7	2.43
753	AUTO REPAIR SERVICE	341,526	37,917	11.1	3.86
754	AUTO SERVICE - NOT REPAIR	25,297	2,965	11.7	2.43
76	MISC. REPAIR SERVICE	221,249	33,616	15.2	2.43
781.2	MOTION PICT. DIST. & PROD	65,467	34,501 e	52.7	1.52
783	MOTION PICTURE THEATER	82,167	28,841 e	35.1	1.52
792	THEAT. PROD. & BANDS	47,361	15,332	32.4	1.52
793	BOWLING & BILLIARDS	31,395	3,642 e	11.6	3.60
7941	PROF. SPORTS CLUBS *	44,454	32,540 e	73.2	3.60
7948	RACING & RACETRACKS *	46,925	0 g	0.0	3.60
7992	GOLF COURSES - NOT MUNI.	10,386	0	0.0	3.60
7996	AMUSEMENT PARKS *	14,202	0 g	0.0	3.60
7997	MEMB. SPORTS & REC. CLUBS	38,395	1,104	2.9	3.60
81	LEGAL SERVICES	546,124	315,308	57.7	3.76
891	ENG.- ARCH. & SURVEY.	563,986	235,329	41.7	3.76
	TOTAL	4,659,553	1,404,889	30.2	

* ESTABLISHMENTS WITH PAYROLL ONLY
e ESTIMATED BASED ON BOSTON % OF STATE PAYROLL
f BASED ON BOSTON % OF NUMBER OF STATE ESTABLISHMENTS
h ESTIMATED BASED ON BOSTON'S SHARE OF STATE BUSINESS RECEIPTS FOR ALL SELECTED SERVICES(29.2%)
g DATA NOT DISCLOSED; ASSUMED TO BE ZERO

SOURCES: U.S. BUREAU OF THE CENSUS, 1977 CENSUS OF SERVICE INDUSTRIES, MASSACHUSETTS;
COUNTY BUSINESS PATTERNS, 1977, MASSACHUSETTS

TABLE A2

ANNUAL PAYROLL BY SELECTED SERVICE INDUSTRIES, 1977
Thousands of Dollars

SIC Code	Kind of Business	Mass.	Suffolk County	Boston*	Boston % of Mass.
7331	Direct Mail Advertising Agency	$9,616	$4,559	$4,369	45.4
7332, 9 pt.	Reproduction & Photocopy	6,318	2,441	2,320	36.7
7941	Professional Sports Clubs	18,714	14,442	13,720	73.2
781,2	Motion Picture Production & Distribution	6,541	3,633	3,451	52.7
783	Motion Picture Theatres	14,773	5,449	5,177	35.1
793	Bowling & Billiards	9,241	1,123	1,067	11.6

* Assumes that Boston accounts for 95 percent of Suffolk County payroll.

Source: U.S. Bureau of the Census, County Business Patterns, 1977, Massachusetts

TABLE A3

LABOR AND PROPRIETORS' INCOME BY PLACE OF WORK, SERVICES
BEA PROJECTIONS TO 1990, MASSACHUSETTS, BOSTON SMSA
Thousands of 1978 Dollars

	1978	1985	1990	1978-1990 Compound Annual Growth Rate
Massachusetts Services	$7,686,938	$9,996,531	$11,674,208	3.54
Hotels & Lodging	160,926	211,437	249,672	3.72
Personal & Misc. Business	1,447,880	1,742,663	1,931,624	2.43
Auto Repair	189,440	247,257	298,440	3.86
Amusement & Recreation	139,373	182,618	213,162	3.60
Motion Pictures	27,542	30,803	33,015	1.52
Misc. Professional Services	1,260,302	1,686,263	1,962,476	3.76
Boston SMSA Services	6,079,907	7,929,168	9,278,816	3.59

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 1980 OBERS BEA Regional Projections, Volumes 1,3, July 1981.

TABLE A4

LABOR AND PROPRIETORS'INCOME BY PLACE OF WORK
SERVICE INDUSTRIES, MASSACHUSETTS, BOSTON SMSA AND SUFFOLK COUNTY,
1967, 1975, 1979
Thousands of 1978 Dollars

	1967	1975	1979	1967-1979 Compound Annual Growth Rate
Massachusetts	$5,293,095	$6,530,775	$7,960,898	3.46
Boston SMSA	4,174,208	5,137,731	6,331,137	3.53
Suffolk County	1,372,274	1,903,068	2,290,545	4.36

Source: Department of Commerce, Bureau of Economic Analysis.

TABLE A5

BUSINESS RECEIPTS IN SELECTED SERVICE INDUSTRIES
MASSACHUSETTS, 1982-1987
THOUSANDS OF 1981 DOLLARS

SIC	TYPE OF BUSINESS	1982	1983	1984	1985	1986	1987
7011	HOTELS & MOTELS	554,021	574,631	596,007	618,179	641,175	665,027
721	LAUNDRY-LINEN & DRY CLEAN	231,629	237,258	243,023	248,928	254,977	261,173
722	PHOTO STUDIOS & PORTRAIT	41,872	42,889	43,932	44,999	46,093	47,213
723.4	BEAUTY & BARBER SHOPS	220,024	225,371	230,848	236,457	242,203	248,089
725	SHOE REPAIR & HAT CLEAN	9,435	9,664	9,899	10,140	10,386	10,639
729	TAX PREPARATION SERVICE *	10,933	11,199	11,471	11,750	12,036	12,328
729	MISC. PERSONAL SERVICES *	73,422	75,206	77,034	78,906	80,823	82,787
729	HEALTH CLUBS & SALONS *	25,163	25,775	26,401	27,043	27,700	28,373
731	ADVERTISING	153,169	156,891	160,703	164,608	168,608	172,705
732	CREDIT & COLLECTION *	18,959	19,420	19,892	20,375	20,870	21,377
7331	DIRECT MAIL ADVERT. *	53,697	55,001	56,338	57,707	59,109	60,546
7332.9	REPRO & PHOTOCOPY *	32,761	33,558	34,373	35,208	36,064	36,940
7333	COMM.PHOT-ART GRAPHIC *	87,214	90,494	93,896	97,427	101,090	104,891
734	SERVICES TO BLDGS	213,767	218,962	224,282	229,733	235,315	241,033
7361	EMPLOYMENT AGENCIES *	47,107	48,252	49,424	50,625	51,855	53,115
737	COMPUTER & DATA PROC.	482,091	493,806	505,805	518,096	530,686	543,582
7391	COMMERCIAL R & D *	287,893	294,889	302,055	309,395	316,913	324,614
7392	MANAGE. CONSULT. & P.R.	707,615	734,222	761,828	790,473	820,195	851,034
7393	ARMORED CAR SERVICES *	15,366	15,740	16,122	16,514	16,915	17,326
7393	ALARM SERVICES *	18,795	19,252	19,720	20,199	20,690	21,193
7393	DETECTIVE & GUARD *	102,956	105,458	108,020	110,645	113,334	116,088
7394	EQUIPMENT RENT & LEASING	181,265	185,670	190,181	194,803	199,536	204,385
7395	PHOTOFINISHING LABS *	65,027	66,607	68,225	69,883	71,581	73,321
7397	COMMERCIAL TESTING LABS *	24,029	24,613	25,211	25,823	26,451	27,094
7399	SIGN PAINTING SHOPS *	2,848	2,918	2,989	3,061	3,136	3,212
7399	PHONE ANSWERING SERVICE *	15,374	15,748	16,130	16,522	16,924	17,335
7399	WATER SOFTEN SERVICE *	1,921	1,968	2,016	2,065	2,115	2,166
7399	PACKAGING & LABELING *	10,620	10,878	11,142	11,413	11,690	11,974
7399	OTHER BUSINESS SERVICE *	144,133	147,636	151,223	154,898	158,662	162,517
7399	INTERIOR DESIGN *	20,520	21,019	21,529	22,053	22,588	23,137
751	AUTO RENTAL & LEASING	216,820	222,089	227,486	233,013	238,676	244,476
752	AUTO PARKING	40,668	41,657	42,669	43,706	44,768	45,856
753	AUTO REPAIR SERVICE	571,321	593,374	616,278	640,066	664,773	690,433
754	AUTO SERVICE - NOT REPAIR	39,484	40,443	41,426	42,433	43,464	44,520
76	MISC. REPAIR SERVICE	345,328	353,719	362,315	371,119	380,137	389,375
781.2	MOTION PICT. DIST. & PROD.	97,723	99,208	100,716	102,247	103,801	105,379
783	MOTION PICTURE THEATER	122,651	124,515	126,408	128,329	130,280	132,260
792	THEAT. PROD. & BANDS	70,696	71,770	72,861	73,969	75,093	76,234
793	BOWLING & BILLIARDS	51,865	53,732	55,666	57,670	59,747	61,897
7941	PROF. SPORTS CLUBS *	73,439	76,002	78,821	81,659	84,599	87,644
7948	RACING & RACETRACKS *	77,521	80,311	83,203	86,198	89,301	92,516
7992	GOLF COURSES - NOT MUNI.	17,158	17,775	18,415	19,078	19,765	20,477
7996	AMUSEMENT PARKS *	23,462	24,307	25,182	26,088	27,027	28,000
7997	MEMB. SPORTS & REC. CLUBS *	63,429	65,712	68,078	70,529	73,068	75,698
81	LEGAL SERVICES	909,192	943,378	978,849	1,015,653	1,053,842	1,093,466
891	ENG.- ARCH. & SURVEY.	938,929	974,233	1,010,864	1,048,872	1,088,310	1,129,230
	TOTAL	7,513,312	7,747,295	7,988,956	8,238,557	8,496,370	8,762,675

Sources: Derived from the 1977 Business Receipts and Forecasted Annual Growth Rates presented in Table A1. Amounts were adjusted to 1981 dollars using the U.S. GNP deflator (1977-1981=1.38425).

BUSINESS RECEIPTS IN SELECTED SERVICE INDUSTRIES
BOSTON, 1982-1987
THOUSANDS OF 1981 DOLLARS

SIC	TYPE OF BUSINESS	1982	1983	1984	1985	1986	1987
7011	HOTELS & MOTELS	154,654	160,407	166,374	172,563	178,982	185,640
721	LAUNDRY-LINEN & DRY CLEAN	50,731	51,964	53,227	54,520	55,845	57,202
722	PHOTO STUDIOS & PORTRAIT	6,112	6,261	6,413	6,569	6,728	6,892
723.4	BEAUTY & BARBER SHOPS	29,560	30,279	31,014	31,768	32,540	33,331
725	SHOE REPAIR & HAT CLEAN	2,831	2,900	2,971	3,043	3,117	3,192
729	TAX PREPARATION SERVICE *	8,664	8,875	9,090	9,311	9,537	9,769
729	MISC. PERSONAL SERVICES *	20,557	21,057	21,569	22,093	22,630	23,180
729	HEALTH CLUBS & SALONS *	7,348	7,527	7,710	7,897	8,089	8,286
731	ADVERTISING	84,883	86,946	89,059	91,223	93,439	95,710
732	CREDIT & COLLECTION *	6,691	6,854	7,020	7,191	7,366	7,545
7331	DIRECT MAIL ADVERT. *	24,378	24,971	25,577	26,199	26,836	27,488
7332.9	REPRO & PHOTOCOPY *	12,023	12,315	12,614	12,921	13,235	13,556
7333	COMM.PHOT-ART GRAPHIC *	37,571	38,984	40,450	41,971	43,549	45,186
734	SERVICES TO BLDGS	65,641	67,237	68,870	70,544	72,258	74,014
7361	EMPLOYMENT AGENCIES *	15,124	15,492	15,868	16,254	16,649	17,053
737	COMPUTER & DATA PROC.	83,272	85,296	87,369	89,492	91,666	93,894
7391	COMMERCIAL R & D *	18,375	18,822	19,279	19,748	20,228	20,719
7392	MANAGE. CONSULT. & P.R.	123,421	128,061	132,876	137,872	143,056	148,435
7393	ARMORED CAR SERVICES *	4,487	4,596	4,708	4,822	4,940	5,060
7393	ALARM SERVICES *	5,488	5,621	5,758	5,898	6,041	6,188
7393	DETECTIVE & GUARD *	73,135	74,912	76,732	78,597	80,507	82,463
7394	EQUIPMENT RENT & LEASING	31,585	32,352	33,138	33,943	34,768	35,613
7395	PHOTOFINISHING LABS *	21,630	22,155	22,694	23,245	23,810	24,389
7397	COMMERCIAL TESTING LABS *	1,583	1,621	1,661	1,701	1,742	1,785
7399	SIGN PAINTING SHOPS *	785	804	824	844	864	885
7399	PHONE ANSWERING SERVICE *	1,939	1,986	2,034	2,083	2,134	2,186
7399	WATER SOFTEN SERVICE *	560	574	588	602	617	632
7399	PACKAGING & LABELING *	3,101	3,177	3,254	3,333	3,414	3,497
7399	OTHER BUSINESS SERVICE *	32,757	33,553	34,368	35,203	36,059	36,935
7399	INTERIOR DESIGN *	5,887	6,030	6,177	6,327	6,481	6,638
751	AUTO RENTAL & LEASING	91,958	94,193	96,482	98,826	101,228	103,688
752	AUTO PARKING	28,761	29,460	30,176	30,909	31,660	32,430
753	AUTO REPAIR SERVICE	63,429	65,878	68,421	71,062	73,805	76,653
754	AUTO SERVICE - NOT REPAIR	4,628	4,740	4,855	4,973	5,094	5,218
76	MISC. REPAIR SERVICE	52,468	53,743	55,049	56,387	57,757	59,161
781.2	MOTION PICT. DIST. & PROD.	51,500	52,282	53,077	53,884	54,703	55,534
783	MOTION PICTURE THEATER	43,051	43,705	44,370	45,044	45,729	46,424
792	THEAT. PROD. & BANDS	22,886	23,234	23,587	23,946	24,310	24,679
793	BOWLING & BILLIARDS	6,017	6,233	6,458	6,690	6,931	7,180
7941	PROF. SPORTS CLUBS *	53,756	55,692	57,697	59,774	61,926	64,155
7948	RACING & RACETRACKS *	0	0	0	0	0	0
7992	GOLF COURSES - NOT MUNI.	0	0	0	0	0	0
7996	AMUSEMENT PARKS *	0	0	0	0	0	0
7997	MEMB. SPORTS & REC. CLUBS *	1,824	1,889	1,958	2,028	2,101	2,177
81	LEGAL SERVICES	524,928	544,665	565,144	586,394	608,442	631,319
891	ENG.- ARCH. & SURVEY.	391,778	406,509	421,793	437,653	454,109	471,183
	TOTAL	2,271,759	2,343,851	2,418,352	2,495,346	2,574,920	2,657,163

Sources: Derived from the 1977 Business Receipts and Forecasted Annual Growth Rates presented in Table A1. Amounts were adjusted to 1981 dollars using the U.S. GNP deflator (1977-1981=1.38425).

Tables from

BOSTON'S RECENT FISCAL HISTORY; CITY OF BOSTON EXPENDITURES AND REVENUE, 1960-FY1982

A Fiscal Accounts Analysis
Drawn Principally from the Records of the Auditing Department
Tables 1960-FY1982

Gregory Perkins

Boston Redevelopment Authority
Research Department

Updated
September 1983

TABLE 1

SUMMARY EXPENDITURE SERIES
CITY OF BOSTON EXPENDITURES BY MAJOR CATEGORY, 1960 - 1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	DEPART-MENTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS	FIXED COSTS	COST OVERRUNS X
1960	228	124	36	9	8	52	0
1961	237	129	38	8	6	56	0
1962	247	133	40	9	10	55	0
1963	264	145	43	9	15	52	0
1964	283	156	47	10	14	56	0
1965	304	168	50	10	14	62	0
1966	337	185	58	11	20	63	0
1967	381	212	65	12	23	69	0
1968	409	212	74	14	30	79	0
1969	373	159	82	15	32	85	0
1970	451	197	93	17	58	86	0
1971	541	215	108	18	77	123	0
1972	576	236	121	21	73	125	0
1974*	849	373	206	34	71	165	0
1975	708	294	161	25	90	138	0
1976	841	342	197	28	108	166	0
1977	848	349	202	30	59	187	21
1978	881	394	212	32	51	177	15
1979	923	424	227	36	46	177	13
1980@	950	391	251	12	62	200	34
1981@	974	383	271	12	25	210	72
1982@	939	354	228	13	8	225	111

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

X NOTE: COST OVERRUNS INCLUDE EXPENDITURES OVER AND ABOVE THOSE ALLOCATED WITHIN THE BUDGET SUCH AS PRIOR YEAR COST DEFICITS, SCHOOL COST OVERRUNS AND TAX ABATEMENT PAYMENTS. AVAILABLE ONLY FOR YEARS 1977 THROUGH 1982.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 2

SUMMARY EXPENDITURE SERIES
CITY OF BOSTON EXPENDITURES BY MAJOR CATEGORY, 1960 - 1982
(IN MILLIONS OF CONSTANT FY1981 DOLLARS)

YEAR	TOTAL	DEPART-MENTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS	FIXED COSTS	COST OVERRU
1960	777	423	123	27	27	177	0
1961	787	428	126	27	20	186	0
1962	793	427	128	29	32	177	0
1963	826	454	135	28	47	163	0
1964	863	476	143	31	43	171	0
1965	903	499	149	30	42	184	0
1966	952	522	164	31	56	178	0
1967	1013	564	173	32	61	184	0
1968	1035	536	187	35	76	200	0
1969	877	374	193	35	75	200	0
1970	979	427	202	37	126	187	0
1971	1098	436	219	37	156	250	0
1972	1112	455	234	41	141	241	0
1974*	1486	653	361	60	124	289	0
1975	1112	462	253	39	141	217	0
1976	1219	496	286	41	157	241	0
1977	1153	475	275	41	80	254	29
1978	1119	500	269	41	65	225	19
1979	1089	500	268	42	54	209	15
1980@	1036	426	274	13	68	218	37
1981@	974	383	271	12	25	210	72
1982@	873	329	212	12	7	209	103

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

X NOTE: COST OVERRUNS INCLUDE EXPENDITURES OVER AND ABOVE THOSE ALLOCATED WITHIN THE BUDGET SUCH AS PRIOR YEAR COST DEFICITS, SCHOOL COST OVERRUNS, AND TAX ABATEMENT PAYMENTS. AVAILABLE ONLY FOR YEARS 1977 THROUGH 1982.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, COMBINED FINANCIAL STATEMENTS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 3

SUMMARY EXPENDITURE SERIES
COMPOSITION OF CITY EXPENDITURES BY MAJOR CATEGORY, 1960 - 1982
(IN PERCENT)

YEAR	TOTAL	DEPART-MENTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS	FIXED COSTS	COST OVERRUNS X
1960	100	54	16	4	4	23	0
1961	100	54	16	3	3	24	0
1962	100	54	16	4	4	22	0
1963	100	55	16	3	6	20	0
1964	100	55	17	4	5	20	0
1965	100	55	16	3	5	20	0
1966	100	55	17	3	6	19	0
1967	100	56	17	3	6	18	0
1968	100	52	18	3	7	19	0
1969	100	43	22	4	9	23	0
1970	100	44	21	4	13	19	0
1971	100	40	20	3	14	23	0
1972	100	41	21	4	13	22	0
1974*	100	44	24	4	8	19	0
1975	100	42	23	4	13	19	0
1976	100	41	23	3	13	20	0
1977	100	41	24	4	7	22	2
1978	100	45	24	4	6	20	2
1979	100	46	25	4	5	19	1
1980@	100	41	26	1	7	21	4
1981@	100	39	28	1	3	22	7
1982@	100	38	24	1	1	24	12

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

X NOTE: COST OVERRUNS INCLUDE EXPENDITURES OVER AND ABOVE THOSE ALLOCATED WITHIN THE BUDGET SUCH AS PRIOR YEAR COST DEFICITS, SCHOOL COST OVERRUNS , AND TAX ABATEMENT PAYMENTS. AVAILABLE ONLY FOR YEARS 1977 THROUGH 1982.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, COMBINED FINANCIAL STATEMENTS," 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 4

DEPARTMENTAL OPERATING EXPENDITURES
CITY OF BOSTON DEPARTMENTAL EXPENDITURES BY FUNCTION, 1960 - 1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	PUBLIC SAFETY	COMMUNITY SERVICES	HUMAN SERVICES	HEALTH AND HOSPITALS	OTHER DEPARTMENTAL
1960	124	33	17	43	21	10
1961	129	33	18	46	21	11
1962	133	32	19	50	21	11
1963	145	34	23	53	22	13
1964	156	35	21	61	25	14
1965	168	39	22	66	26	15
1966	185	40	24	78	28	15
1967	212	43	27	93	33	16
1968	212	48	31	74	37	22
1969	159	54	36	7	39	23
1970	197	68	40	14	48	26
1971	215	73	44	18	53	26
1972	236	86	48	21	60	21
1974*	373	130	76	30	83	54
1975	294	106	54	26	66	42
1976	342	119	71	32	71	49
1977	349	112	78	36	68	55
1978	394	129	74	47	75	69
1979	424	132	81	68	75	68
1980@	391	133	72	53	90	43
1981@	383	128	72	40	96	47
1982@	354	114	73	20	103	44

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 5

DEPARTMENTAL OPERATING EXPENDITURES
CITY OF BOSTON DEPARTMENTAL EXPENDITURES BY FUNCTION, 1960 - 1982
(IN MILLIONS OF CONSTANT FY1981 DOLLARS)

YEAR	TOTAL	PUBLIC SAFETY	COMMUNITY SERVICES	HUMAN SERVICES	HEALTH AND HOSPITALS	OTHER DEPARTMENTAL
1960	423	113	58	147	72	34
1961	428	110	60	153	76	37
1962	427	103	61	161	67	35
1963	454	106	72	166	69	41
1964	476	107	64	186	76	43
1965	499	116	65	196	77	45
1966	522	113	68	220	79	42
1967	564	114	72	247	88	43
1968	536	121	78	187	94	56
1969	374	127	85	16	92	54
1970	427	148	87	30	104	56
1971	436	148	89	37	108	53
1972	455	166	93	41	116	41
1974*	653	228	133	53	145	95
1975	462	166	85	41	104	66
1976	496	173	103	46	103	71
1977	475	152	106	49	92	75
1978	500	164	94	60	95	88
1979	500	156	96	80	89	80
1980@	426	145	78	58	98	47
1981@	383	128	72	40	96	47
1982@	329	106	68	19	96	41

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 6

DEPARTMENTAL OPERATING EXPENDITURES
CITY OF BOSTON DEPARTMENTAL EXPENDITURES BY FUNCTION, 1960 - 1982
(IN PERCENT)

YEAR	TOTAL	PUBLIC SAFETY	COMMUNITY SERVICES	HUMAN SERVICES	HEALTH AND HOSPITALS	OTHER DEPARTMENTAL
1960	100	27	14	35	17	8
1961	100	26	14	36	16	9
1962	100	24	14	38	16	8
1963	100	23	16	37	15	9
1964	100	22	13	39	16	9
1965	100	23	13	39	15	9
1966	100	22	13	42	15	8
1967	100	20	13	44	16	8
1968	100	23	15	35	17	10
1969	100	34	23	4	25	14
1970	100	35	20	7	24	13
1971	100	34	20	8	25	12
1972	100	36	20	9	25	9
1974*	100	35	20	8	22	14
1975	100	36	18	9	22	14
1976	100	35	21	9	21	14
1977	100	32	22	10	19	16
1978	100	33	19	12	19	18
1979	100	31	19	16	18	16
1980^	100	34	18	14	23	11
1981^	100	33	19	10	25	12
1982^	100	32	21	6	29	12

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

^ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 7

OTHER EXPENDITURE CATEGORIES
CITY OF BOSTON EXPENDITURES FOR OTHER FUNCTIONS, 1960 - 1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS
1960	52	36	8	8
1961	52	38	8	6
1962	59	40	9	10
1963	67	43	9	15
1964	71	47	10	14
1965	74	50	10	14
1966	89	58	11	20
1967	100	65	12	23
1968	118	74	14	30
1969	119	82	15	32
1970	168	93	17	58
1971	203	108	18	77
1972	215	121	21	73
1974*	311	206	34	71
1975	276	161	25	90
1976	333	197	28	108
1977	291	202	30	59
1978	295	212	32	51
1979	309	227	36	46
1980@	325	251	12	62
1981@	308	271	12	25
1982@	249	228	13	8

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 8

OTHER EXPENDITURE CATEGORIES
CITY OF BOSTON EXPENDITURES FOR OTHER [illegible]

YEAR	TOTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS
1960	177	123	27	27
1961	173	126	27	20
1962	189	128	29	32
1963	210	135	28	47
1964	217	143	31	43
1965	220	149	30	42
1966	251	164	31	56
1967	266	173	32	61
1968	299	187	35	76
1969	288	193	35	75
1970	365	202	37	126
1971	412	219	37	156
1972	415	234	41	141
1974*	544	361	60	124
1975	433	253	39	141
1976	483	286	41	157
1977	396	275	41	80
1978	375	269	41	65
1979	365	268	42	54
1980@	354	274	13	68
1981@	308	271	12	25
1982@	232	212	12	7

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 9

OTHER EXPENDITURE CATEGORIES
COMPOSITION OF CITY EXPENDITURES FOR OTHER FUNCTIONS, 1960 - 1982
(IN PERCENT)

YEAR	TOTAL	SCHOOL	COUNTY	CAPITAL OUTLAYS
1960	100	69	15	15
1961	100	73	15	12
1962	100	68	15	17
1963	100	64	13	22
1964	100	66	14	20
1965	100	68	14	19
1966	100	65	13	22
1967	100	65	12	23
1968	100	63	12	25
1969	100	69	13	27
1970	100	55	10	35
1971	100	53	9	38
1972	100	55	10	34
1974*	100	66	11	23
1975	100	58	9	33
1976	100	59	8	32
1977	100	69	10	20
1978	100	72	11	17
1979	100	73	12	15
1980@	100	77	4	19
1981@	100	88	4	8
1982@	100	92	5	3

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 19

FIXED COST EXPENDITURES
CITY OF BOSTON EXPENDITURES FOR FIXED COSTS BY CATEGORY, 1960 - 1
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	DEBT SERVICE	ASSESSMENTS STATE	MBC	MBTA	PENSIONS	TH FU
1960	51.0	17.5	.1	5.9	12.8	12.7	2
1961	56.2	17.0	.0	6.6	14.5	16.7	1
1962	54.1	15.5	.0	6.9	13.7	16.4	1
1963	52.2	14.5	.1	8.0	11.3	16.0	1
1964	54.9	14.8	.2	9.4	12.3	16.7	1
1965	63.1	25.9	.1	9.3	8.0	18.4	1
1966	62.9	16.4	.1	9.4	11.6	23.9	1
1967	68.2	19.6	.4	10.0	13.5	22.7	2
1968	78.7	27.5	.4	10.4	15.0	23.4	1
1969	85.5	29.6	.5	11.1	16.8	26.4	1
1970	85.7	29.7	.6	14.1	15.5	24.6	1
1971	123.0	39.7	.5	14.8	25.1	41.4	1
1972	126.5	42.5	.6	16.2	29.7	36.2	1
1974*	164.5	59.8	.6	17.1	34.5	50.5	2
1975	137.8	52.0	.6	19.4	25.1	38.9	1
1976	165.9	59.7	.5	22.0	31.5	50.2	2
1977	186.1	70.8	.7	21.0	30.8	60.2	2
1978	177.3	68.3	2.0	4.0	32.5	68.4	2
1979	176.7	73.0	1.6	4.4	35.6	61.4	
1980	199.5	74.5	1.5	4.5	33.9	83.7	1
1981@	209.5	76.8	1.8	4.3	39.0	87.6	
1982@	224.9	74.4	1.9	4.2	42.5	92.9	9

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 11

FIXED COST EXPENDITURES
CITY OF BOSTON EXPENDITURES FOR FIXED COSTS BY CATEGORY, 1960 - 1982
(IN MILLIONS OF CONSTANT FY1981 DOLLARS)

YEAR	TOTAL	DEBT SERVICE	ASSESSMENTS STATE	MBC	MBTA	PENSIONS	TRUST FUNDS
1960	173.9	59.7	.3	20.1	43.6	43.3	6.8
1961	185.6	56.4	.0	21.9	48.1	55.4	4.6
1962	173.7	49.9	.0	22.1	44.0	52.6	5.1
1963	163.4	45.4	.3	27.5	35.4	50.1	4.7
1964	167.4	45.1	.6	28.7	37.5	50.9	4.6
1965	187.4	76.9	.3	27.6	23.8	54.6	4.2
1966	177.4	46.2	.3	26.5	32.7	67.1	4.5
1967	181.4	52.1	1.1	25.6	35.9	60.4	5.3
1968	199.1	69.6	1.0	26.7	40.0	59.2	3.0
1969	200.9	69.6	1.2	26.1	39.5	62.0	2.6
1970	186.0	64.4	1.3	30.6	33.6	53.4	2.6
1971	249.7	80.6	1.0	30.0	51.0	84.0	3.0
1972	244.1	82.0	1.2	31.3	57.3	69.9	2.5
1974*	287.9	104.6	1.0	29.9	60.4	88.4	3.5
1975	216.3	81.6	.9	30.5	39.4	61.1	2.8
1976	240.6	86.6	.7	31.9	45.7	72.8	2.9
1977	253.1	96.3	1.0	28.6	41.9	81.9	3.5
1978	225.2	86.7	2.5	5.1	41.3	86.9	2.5
1979	208.5	85.1	1.9	5.2	42.0	72.5	.8
1980	217.5	81.2	1.7	4.9	37.0	91.2	1.4
1981@	209.5	76.8	1.8	4.3	39.0	87.6	.0
1982@	209.2	69.2	1.8	3.9	39.5	85.4	8.4

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 12

FIXED COST EXPENDITURES
COMPOSITION OF CITY OF BOSTON FIXED COST EXPENDITURES, 1960 - 19
(IN PERCENT)

YEAR	TOTAL	DEBT SERVICE	ASSESSMENTS STATE	MDC	MBTA	PENSIONS	TR FU
1960	100	34	.2	12	25	25	
1961	100	30	.0	12	26	30	2
1962	100	29	.0	13	25	30	
1963	100	28	.2	17	22	31	2
1964	100	27	.4	17	22	30	2
1965	100	41	.2	15	13	29	2
1966	100	20	.2	15	18	30	2
1967	100	29	.6	15	20	33	2
1968	100	35	.5	13	20	30	1
1969	100	35	.6	13	20	31	1
1970	100	35	.7	16	18	29	1
1971	100	32	.4	12	20	34	1
1972	100	34	.5	13	23	29	1
1974*	100	36	.4	10	21	31	1
1975	100	38	.4	14	18	28	1
1976	100	36	.3	13	19	30	1
1977	100	38	.4	11	17	32	1
1978	100	39	1.1	2	18	39	1
1979	100	41	.9	2	20	35	
1980	100	37	.8	2	17	42	
1981@	100	37	.9	2	19	42	
1982@	100	33	.8	2	19	41	4

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 13

SUMMARY REVENUE SERIES
CITY OF BOSTON REVENUES BY MAJOR SOURCE, 1961 - 1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	LOCAL TAX REVENUE	NON-TAX LOCAL REVENUE	LONG TERM LOANS	STATE AID	FEDERAL AID
1960	226	146	22	6	30	10
1961	236	149	24	4	40	19
1962	249	149	31	7	40	22
1963	251	143	32	9	43	24
1964	279	148	55	19	31	27
1965	298	170	61	12	25	30
1966	314	157	71	16	29	41
1967	383	179	68	32	58	46
1968	388	200	78	25	47	38
1969	385	226	68	39	44	8
1970	447	251	75	54	52	15
1971	501	279	82	77	40	23
1972	596	309	85	84	86	30
1974*	862	483	132	70	105	72
1975	658	333	98	40	98	89
1976	792	340	105	85	137	125
1977	880	415	124	75	133	133
1978	862	424	96	65	139	138
1979	931	429	102	55	197	148
1980@	967	439	134	55	182	157
1981@	985	512	120	0	186	167
1982@	929	462	132	0	219	116

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 14

SUMMARY REVENUE SERIES
CITY OF BOSTON REVENUES BY MAJOR SOURCE, 1960 - 1982
(MILLIONS OF CONSTANT FY81 DOLLARS)

YEAR	TOTAL	LOCAL TAX REVENUE	NON-TAX LOCAL REVENUE	LONG TERM LOANS	STATE AID	FEDERAL AID
1960	771	498	75	20	123	55
1961	784	495	80	13	133	63
1962	799	478	100	22	128	71
1963	786	448	100	28	135	75
1964	851	451	168	58	92	82
1965	885	505	181	36	72	89
1966	885	443	200	45	82	116
1967	1019	476	181	85	154	122
1968	982	506	197	63	119	96
1969	905	531	160	92	103	19
1970	970	545	163	117	113	33
1971	1017	566	166	156	81	47
1972	1150	596	164	162	170	58
1974*	1509	845	231	123	184	126
1975	1033	523	154	63	154	140
1976	1148	493	152	123	199	181
1977	1197	564	169	102	181	181
1978	1095	538	122	83	177	175
1979	1099	506	120	65	232	175
1980@	1054	479	146	62	198	171
1981@	985	512	120	0	186	167
1982@	864	430	123	0	204	108

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLU
FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIE
MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CAT
EGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS
WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING
DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON
PRELIMINARY FISCAL WORKSHEETS, 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 15

SUMMARY REVENUE SERIES
COMPOSITION OF CITY REVENUES BY MAJOR SOURCE, 19[illegible] - 19[illegible]
(IN PERCENT)

YEAR	TOTAL	LOCAL TAX REVENUE	NON-TAX LOCAL REVENUE	LONG TERM LOANS	STATE AID	FEDERAL AID
1960	100	65	10	3	16	7
1961	100	63	10	2	17	8
1962	100	60	12	3	16	9
1963	100	57	13	4	17	10
1964	100	53	20	7	11	10
1965	100	57	20	4	8	10
1966	100	50	23	5	9	13
1967	100	47	18	8	15	12
1968	100	52	20	6	12	10
1969	100	59	18	10	11	2
1970	100	56	17	12	12	3
1971	100	56	16	15	8	5
1972	100	52	14	14	15	5
1974*	100	56	15	8	12	8
1975	100	51	15	6	15	14
1976	100	43	13	11	17	16
1977	100	47	14	9	15	15
1978	100	49	11	8	16	16
1979	100	46	11	6	21	16
1980@	100	45	14	6	19	16
1981@	100	52	12	0	19	17
1982@	100	50	14	0	24	12

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS, 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 16

LOCAL TAX REVENUE
CITY OF BOSTON LOCAL TAX REVENUE BY SOURCE, 196[illegible]-1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	PROPERTY TAX COLLECTIONS	MOTOR VEHICLES EXCISE COLLECTIONS	PAYMENTS IN-LIEU-OF TAXES	TAX TITLES AND POSSESSIONS
1960	145.8	130.3	4.9	.9	1.7
1961	148.9	138.6	7.6	.8	1.9
1962	148.8	135.7	8.0	2.6	2.5
1963	143.2	129.0	8.0	3.0	2.4
1964	148.1	135.6	8.8	2.0	1.7
1965	159.9	156.0	8.?	2.3	3.3
1966	156.8	142.3	8.2	4.5	1.8
1967	179.0	163.6	9.3	4.6	1.5
1968	200.1	186.1	9.0	2.0	2.2
1969	225.6	209.2	9.0	4.9	2.5
1970	251.3	234.0	9.9	5.7	1.7
1971	279.2	262.3	9.3	5.1	2.5
1972	309.3	293.4	7.4	5.6	2.9
1974*	483.4	452.2	14.5	12.7	4.0
1975	333.1	306.2	12.1	10.3	4.5
1976	339.9	312.4	11.5	10.8	5.2
1977	415.4	389.4	12.5	11.6	1.9
1978	424.0	389.1	11.2	15.9	7.8
1979	429.2	389.4	12.2	20.1	7.5
1980@	438.6	397.2	15.6	18.8	7.0
1981@	512.4	472.1	13.2	20.5	6.6
1982@	462.3	410.1	5.7	21.7	24.8

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 17

LOCAL TAX REVENUE
CITY OF BOSTON LOCAL TAX REVENUE BY SOURCE, 1960-1982
(MILLIONS OF CONSTANT FY81 DOLLARS)

YEAR	TOTAL	PROPERTY TAX COLLECTIONS	MOTOR VEHICLES EXCISE COLLECTIONS	PAYMENTS IN-LIEU-OF TAXES	TAX TITLES AND POSSESSION
1960	497.2	471.6	16.7	3.1	5.8
1961	494.3	460.2	25.2	2.7	6.3
1962	477.6	435.6	25.7	8.3	8.0
1963	448.2	406.3	25.0	9.4	7.5
1964	451.7	413.6	26.0	6.1	5.2
1965	504.6	463.3	24.7	6.8	9.8
1966	442.2	401.3	23.1	12.7	5.1
1967	476.1	435.2	24.7	12.2	4.1
1968	506.3	470.8	22.8	7.1	5.6
1969	530.2	491.6	21.1	11.5	5.9
1970	545.3	507.8	21.5	12.4	3.7
1971	566.9	532.5	18.9	10.4	5.1
1972	596.9	566.3	14.3	10.8	5.6
1974*	845.9	791.3	25.4	22.2	7.0
1975	523.6	486.7	19.0	16.2	7.1
1976	492.9	453.0	16.7	15.7	7.5
1977	564.9	529.6	17.0	15.8	2.6
1978	538.5	494.2	14.2	20.2	9.9
1979	506.5	459.5	14.4	23.7	8.9
1980@	478.1	432.9	17.0	20.5	7.6
1981@	512.4	472.1	13.2	20.5	6.6
1982@	429.9	381.4	5.3	20.2	23.1

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 18

LOCAL TAX REVENUE
COMPOSITION OF CITY OF BOSTON LOCAL TAX REVENUE, 1961-1982
(IN PERCENT)

YEAR	TOTAL	PROPERTY TAX COLLECTIONS	MOTOR VEHICLES EXCISE COLLECTIONS	PAYMENTS IN-LIEU-OF TAXES	TAX TITLES AND POSSESSIONS
1960	100	95	3	1	1
1961	100	93	5	1	1
1962	100	91	5	2	2
1963	100	91	6	2	2
1964	100	92	5	1	1
1965	100	92	5	1	2
1966	100	91	5	3	1
1967	100	91	5	3	1
1968	100	93	4	1	1
1969	100	93	4	2	1
1970	100	93	4	2	1
1971	100	94	3	2	1
1972	100	95	2	2	1
1974*	100	94	3	3	1
1975	100	92	4	3	1
1976	100	92	3	3	2
1977	100	94	3	3	1
1978	100	92	3	4	2
1979	100	91	3	5	2
1980@	100	91	4	4	2
1981@	100	92	3	4	1
1982@	100	89	1	5	5

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 19

NON-TAX LOCAL REVENUE
CITY OF BOSTON: NON-TAX LOCAL REVENUE BY SOURCE 1960-1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	DEPARTMENTAL REVENUE	HEALTH AND HOSPITALS	TRUST FUNDS
1960	22	14	6	2
1961	24	17	6	1
1962	31	22	7	2
1963	32	23	7	2
1964	55	44	9	2
1965	61	48	11	2
1966	71	58	11	2
1967	68	51	15	2
1968	78	55	22	1
1969	68	40	26	2
1970	75	37	37	1
1971	82	38	42	2
1972	85	45	38	2
1974*	132	60	69	3
1975	98	41	53	4
1976	105	42	59	4
1977	124	60	59	5
1978	96	35	56	5
1979	102	43	55	4
1980@	134	35	96	3
1981@	120	36	81	3
1982@	132	41	88	3

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

TABLE 21

NON-TAX LOCAL REVENUE
CITY OF BOSTON NON-TAX LOCAL REVENUE BY SOURCE 1960-1982
(MILLIONS OF CONSTANT FY81 DOLLARS)

YEAR	TOTAL	DEPARTMENTAL REVENUE	HEALTH AND HOSPITALS	TRUST FUNDS
1960	75	48	20	7
1961	80	56	20	3
1962	100	71	22	6
1963	100	72	22	6
1964	138	134	27	8
1965	181	143	33	6
1966	200	164	31	6
1967	181	136	44	5
1968	197	139	56	3
1969	160	94	61	5
1970	163	80	80	2
1971	166	77	85	4
1972	164	87	73	4
1974*	231	105	121	5
1975	154	64	83	6
1976	152	61	86	6
1977	169	82	80	7
1978	122	44	71	6
1979	120	51	65	5
1980@	146	38	105	3
1981@	120	36	81	3
1982@	123	38	82	3

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLU
FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIE
MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CAT
EGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS
WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING
DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON
PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 21

NON-TAX LOCAL REVENUE

COMPOSITION OF BOSTON'S NON-TAX LOCAL REVENUE, 1960-1982
(IN PERCENT)

YEAR	TOTAL	DEPARTMENTAL REVENUE	HEALTH AND HOSPITALS	TRUST FUNDS
1960	100			
1961	100	64	27	9
1962	100	71	25	4
1963	100	71	23	6
1964	100	72	22	6
1965	100	80	16	4
1966	100	79	18	3
1967	100	82	15	3
1968	100	75	22	3
1969	100	71	28	1
		59	38	3
1970	100			
1971	100	49	49	1
1972	100	46	51	2
1974*	100	53	45	2
1975	100	45	52	2
1976	100	42	54	4
1977	100	40	56	4
1978	100	48	48	4
1979	100	36	58	5
1980	100	42	54	4
		26	72	2
1981	100			
1982	100	30	67	2
		31	67	2

NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

URCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979. AUDITORS REPORTS, COOPERS AND LYBRAND, "CITY OF BOSTON, PRELIMINARY FISCAL WORKSHEETS," 1980-1982.

E MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 22

STATE AID
CITY OF BOSTON: STATE REVENUE RECEIPTS BY FUNCTION, 19[illegible] - 1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	EDUCATION CAPITAL	EDUCATION OPERATING	URBAN RENEWAL	HIGH-WAY	COUNT	CT
1960	36.0	.1	2.8	.0	.1	.1	3
1961	40.0	.3	7.6	.0	.0	.2	3
1962	46.0	.2	5.6	.3	.0	.3	3
1963	43.0	.2	6.1	.2	1.1	.3	3
1964	30.0	.2	5.2	.4	2.0	.4	2
1965	25.6	.2	7.1	.1	.3	.3	1
1966	29.0	.2	11.3	.2	1.4	.3	1
1967	58.0	.2	22.8	.2	1.0	.3	3
1968	47.0	.6	22.9	2.0	.1	.2	2
1969	44.0	.5	24.1	.6	.8	.4	1
1970	52.0	.4	40.6	.8	2.9	.6	
1971	40.0	2.3	27.0	2.8	.4	.0	
1972	88.0	2.5	68.5	1.9	6.8	.3	
1974*	105.0	4.0	82.2	1.8	4.3	1.0	1
1975	98.0	10.5	68.6	1.7	1.8	.0	1
1976	137.0	31.9	88.3	1.7	1.4	.7	1
1977	133.0	16.2	100.3	1.7	1.5	.7	1
1978	139.0	17.7	97.2	1.7	1.4	3.7	1
1979	157.0	15.4	122.0	3.7	1.3	28.9	2
1980P	181.8	14.3	122.4	1.7	2.1	.4	4
1981P	186.4	18.5	122.9	1.7	.9	.4	4
1982P	218.7	15.2	127.2	.9	1.1	.4	7

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

P NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "BOSTON CHERRY SHEET AID: FY80, FY81, FY82," Sept. 1982.

TABLE 23

STATE AID
CITY OF BOSTON STATE REVENUE RECEIPTS BY FUNCTION, 19[illegible] - 1982
(IN MILLIONS OF CONSTANT FY1981 DOLLARS)

YEAR	TOTAL	EDUCATION CAPITAL	EDUCATION OPERATING	URBAN RENEWAL	HIGH-WAY	COURT	OTHER
1960	122.8	.3	9.5	.4	.0	.0	111.2
1961	132.8	1.4	23.2	.0	.0	.7	107.2
1962	120.4	.6	18.0	1.0	.0	1.4	108.2
1963	134.6	.6	18.8	.6	3.4	.9	108.9
1964	91.5	.6	15.9	1.2	6.1	1.2	67.7
1965	74.2	.6	17.8	.6	.9	.9	52.9
1966	81.8	.0	31.9	.6	3.9	.9	44.6
1967	154.3	.5	60.0	.5	2.7	.8	87.2
1968	118.9	1.5	57.9	5.1	.0	.5	53.6
1969	103.4	1.2	56.6	1.4	1.9	.9	41.9
1970	112.8	.9	88.1	1.7	6.3	1.3	14.5
1971	81.2	4.7	54.8	5.7	.8	.6	14.6
1972	169.8	4.8	132.2	3.7	13.1	.6	16.4
1974*	183.7	7.0	143.8	3.1	7.5	1.7	21.3
1975	153.9	16.5	107.7	2.7	2.8	.9	22.6
1976	198.6	46.3	128.0	2.5	2.0	1.0	17.5
1977	180.9	22.0	136.4	2.3	2.6	1.0	17.3
1978	176.5	22.5	123.4	2.2	1.8	4.7	21.6
1979	232.5	18.2	144.0	4.4	1.5	34.1	30.1
1980@	198.2	15.6	133.4	1.9	2.2	.4	44.7
1981@	186.4	18.5	122.9	1.7	.9	.4	42.0
1982@	203.4	14.1	118.3	.8	1.0	.4	68.7

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "BOSTON CHERRY SHEET AID: FY80,FY81,FY82," JAN. 1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 24

STATE AID
COMPOSITION OF STATE REVENUE TO THE CITY OF BOSTON, 19[illegible] - 198[illegible]
(IN PERCENT)

YEAR	TOTAL	EDUCATION CAPITAL	EDUCATION OPERATING	URBAN RENEWAL	HIGH-WAY	COURT	C
1960	100	.3	8	.0	.0	.0	
1961	100	.8	17	.0	.0	.5	
1962	100	.5	14	.8	.0	.8	
1963	100	.5	14	.5	2.0	.7	
1964	100	.7	17	1.3	6.7	1.3	
1965	100	.8	24	.0	1.2	1.2	
1966	100	.7	33	.7	4.8	1.1	
1967	100	.3	39	.3	1.7	.5	
1968	100	1.3	49	4.3	.0	.4	
1969	100	1.1	55	1.4	1.8	.9	
1970	100	.8	78	1.5	5.6	1.2	
1971	100	5.7	67	7.0	1.0	.0	
1972	100	2.8	78	2.2	7.7	.3	
1974*	100	3.8	78	1.7	4.1	1.0	
1975	100	10.7	70	1.7	1.8	.6	
1976	100	23.3	54	1.2	1.0	.5	
1977	100	12.2	75	1.3	1.1	.5	
1978	100	12.7	70	1.2	1.0	2.7	
1979	100	7.8	62	1.9	.7	14.7	
1980@	100	7.9	67	.9	1.1	.2	
1981@	100	9.9	66	.9	.5	.2	
1982@	100	7.0	58	.4	.5	.2	

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "BOSTON CHERRY SHEET AID: FY80, FY81, FY82," JAN. 1982.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

TABLE 25

FEDERAL AID
CITY OF BOSTON FEDERAL REVENUE RECEIPTS BY FUNCTION, 196[illegible]-1982
(IN MILLIONS OF CURRENT YEAR DOLLARS)

YEAR	TOTAL	EDUCATION	URBAN ECONOMIC DEVELOPMENT	MANPOWER DEVELOPMENT	FISCAL ASSISTANCE	WELFARE/ HUMAN SERVICES	OTHER
960	15.5	.1	.0	.0	.0	15.4	.0
961	19.3	.2	.0	.0	.0	19.1	.0
962	21.9	.1	.0	.0	.0	21.8	.0
963	24.0	.4	.0	.0	.0	23.6	.0
964	26.6	.9	.0	.0	.0	25.7	.0
965	31.2	1.7	.0	.0	.0	29.5	.0
966	40.8	5.6	.0	.0	.0	35.2	.0
967	46.0	6.4	.2	.0	.0	39.4	.0
968	37.7	7.2	.3	.0	.0	30.1	.1
969	7.7	5.9	1.5	.0	.0	.3	.0
970	14.9	8.3	1.1	.1	.0	4.6	.8
971	23.0	8.6	2.3	.7	.0	9.9	1.5
972	29.6	10.4	2.9	3.7	.0	11.4	1.2
974*	71.8	14.4	2.1	5.0	29.0	14.0	6.5
975	88.8	13.3	4.1	22.7	21.0	23.4	4.3
976	125.3	14.0	31.0	27.4	41.0	6.5	6.2
977	132.9	20.0	36.2	35.4	33.0	2.8	5.5
978	137.9	14.8	31.7	39.0	46.4	2.2	3.8
979	148.0	25.0	40.0	52.0	26.8	2.0	2.8
980	156.7	20.2	42.2	47.5	39.9	2.7	4.2
981	167.4	25.9	77.7	29.9	21.9	11.7	1.1
982	115.8	20.9	55.9	9.2	18.6	11.0	.3

NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "THE EFFECTS OF PRESIDENT REAGANS PROPOSED FISCAL YEAR 1983 ON THE CITY OF BOSTON," FEBRUARY 1982.

TABLE 20

FEDERAL AID
CITY OF BOSTON FEDERAL REVENUE RECEIPTS BY FUNCTION, 1960-1982
(IN MILLIONS OF CONSTANT 1981 DOLLARS)

YEAR	TOTAL	EDUCATION	URBAN ECONOMIC DEVELOPMENT	MANPOWER DEVELOPMENT	FISCAL ASSISTANCE	WELFARE/ HUMAN SERVICES
1960	52.9	.3	.0	.0	.0	52.5
1961	64.1	.7	.0	.0	.0	63.4
1962	70.3	.3	.0	.0	.0	70.0
1963	75.1	1.3	.0	.0	.0	73.9
1964	81.1	2.7	.0	.0	.0	78.4
1965	89.7	5.0	.0	.0	.0	84.6
1966	115.1	15.8	.0	.0	.0	99.3
1967	122.4	17.4	.5	.0	.0	104.8
1968	95.4	18.2	.8	.0	.0	76.2
1969	18.1	13.9	3.5	.0	.0	.7
1970	32.3	18.0	2.4	.2	.0	10.6
1971	46.7	17.5	4.7	1.4	.0	20.1
1972	57.1	20.1	5.6	7.1	.0	22.0
1974*	125.6	25.2	3.7	8.8	50.7	25.9
1975	139.4	20.9	6.4	35.6	33.0	36.7
1976	181.7	20.3	44.9	39.7	59.4	9.4
1977	180.7	27.2	49.2	48.1	44.9	3.8
1978	175.1	18.8	40.3	49.5	58.9	2.8
1979	174.6	29.5	47.2	61.4	31.6	2.4
1980@	170.8	22.0	46.0	51.8	43.5	2.9
1981@	167.4	25.9	77.7	29.9	21.9	11.7
1982@	107.7	19.4	52.0	8.6	17.3	10.2

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "THE EFFECTS OF PRESIDENT REAGANS PROPOSED FISCAL YEAR 1983 ON THE CITY OF BOSTON," FEBRUARY 1982.

ROWS MAY NOT EXACTLY EQUAL TOTAL DUE TO ROUNDING

TABLE 27

FEDERAL AID
COMPOSITION OF FEDERAL AID TO THE CITY OF BOSTON, 1960-1982
(IN PERCENT)

YEAR	TOTAL	EDUCATION	URBAN ECONOMIC DEVELOPMENT	MANPOWER DEVELOPMENT	FISCAL ASSISTANCE	WELFARE/ HUMAN SERVICES	OTHER
1960	100	.6	.0	.0	.0	99.4	.0
1961	100	1.0	.0	.0	.0	99.1	.0
1962	100	.5	.0	.0	.0	99.5	.0
1963	100	1.7	.0	.0	.0	98.3	.0
1964	100	3.4	.0	.0	.0	96.6	.0
1965	100	5.6	.0	.0	.0	94.4	.0
1966	100	13.7	.0	.0	.0	86.3	.0
1967	100	13.9	.4	.0	.0	85.7	.0
1968	100	19.1	.8	.0	.0	79.8	.3
1969	100	76.6	19.5	.0	.0	3.9	.0
1970	100	55.7	7.4	.7	.0	30.9	5.4
1971	100	37.4	10.0	3.0	.0	43.0	6.5
1972	100	35.1	9.8	12.5	.0	38.5	4.1
1974*	100	20.1	2.9	7.0	40.4	21.6	9.1
1975	100	15.0	4.6	25.6	23.6	26.4	4.8
1976	100	11.2	24.7	21.9	32.7	5.2	4.9
1977	100	15.0	27.2	26.6	24.9	2.1	4.1
1978	100	10.7	23.0	28.3	33.6	1.6	2.8
1979	100	16.9	27.0	35.1	18.1	1.4	1.9
1980@	100	12.9	26.9	30.3	25.5	1.7	2.7
1981@	100	15.5	46.4	17.9	13.1	7.0	.7
1982@	100	18.0	48.3	7.9	16.1	9.5	.3

* NOTE: FY1974 INCLUDES 18 MONTH TIME SPAN, 12 MONTHS 1973 PLUS FIRST 6 MONTHS 1974. HIGHER TOTAL REFLECTS THIS FACT.

@ NOTE: 1980-1982 EXPENDITURE AND REVENUE SERIES SUB-CATEGORIES MAY NOT BE ENTIRELY CONSISTENT WITH PRIOR YEAR SUB-CATEGORIES BECAUSE PRELIMINARY AND LESS DETAILED REPORTS WERE USED.

SOURCE: CITY OF BOSTON AND COUNTY OF SUFFOLK, AUDITING DEPARTMENT, ANNUAL FINANCIAL REPORTS, 1960-1979.
CITY OF BOSTON, OFFICE OF INTERGOVERNMENTAL RELATIONS, "THE EFFECTS OF PRESIDENT REAGANS PROPOSED FISCAL YEAR 1983 ON THE CITY OF BOSTON," FEBRUARY 1983.

ROWS MAY NOT EQUAL 100 PERCENT DUE TO ROUNDING

Documentation Materials
Tax Policy Study Group
John Avault
August 13, 1979

THE "LOTTERY" FORMULA

The Equalizing Municipal Grant (E.M.G., alias "Lottery") formula is an important mechanism for state aid distribution. It provides funds for general municipal services on the basis of relative equalized value per capita and population. Communities with larger populations and/or lower per capita property tax base receive more aid. The formula for determining an individual community's share of funds is:

$$\text{Town}_i \text{ Share} = \frac{\dfrac{\text{State Equalized Value Per Capita}}{\text{Equalized Value per Capita, Town}_i} \times \text{Population of Town}_i}{\sum_{i=1}^{351} \left(\dfrac{\text{State Equalized Value Per Capita}}{\text{Equalized Value Per Capita, Town}_i} \times \text{Population of Town}_i \right)}$$

The following table lists for each of the 351 cities and towns in Massachusetts the present share of aid currently due under the E.M.G. formula. Population, total and per capita 1978 equalized value, and the percent share received when the 1976 equalized values were in effect are also presented in the table.

		1975 POPULATION	1978 EQUAL. VALUE	EQ. VALUE PER CAPITA	1978 % AID	1976 % AID
1	ABINGTON	13,456	133,200,000	9,898.9	0.224	0.229
2	ACTON	18,209	338,800,100	18,606.2	0.161	0.168
3	ACUSHNET	8,439	84,470,000	10,009.5	0.139	0.131
4	ADAMS	11,270	82,050,000	7,280.4	0.255	0.227
5	AGAWAM	24,305	300,699,900	12,371.9	0.324	0.319
6	ALFORD	337	10,610,000	31,483.7	0.002	0.002
7	AMESBURY	13,752	109,000,000	7,926.1	0.286	0.281
8	AMHERST	22,308	231,700,000	10,386.4	0.354	0.354
9	ANDOVER	26,050	507,099,900	19,466.4	0.220	0.232
10	ARLINGTON	50,223	611,500,000	12,175.7	0.680	0.707
11	ASHBURNHAM	3,834	45,780,000	11,940.5	0.053	0.055
12	ASHBY	2,348	22,570,000	9,612.4	0.040	0.043
13	ASHFIELD	1,420	28,030,000	19,739.4	0.012	0.014
14	ASHLAND	8,906	123,900,000	13,912.0	0.105	0.106
15	ATHOL	10,849	78,170,000	7,205.3	0.248	0.235
16	ATTLEBORO	32,650	365,600,000	11,197.5	0.480	0.482
17	AUBURN	15,626	189,800,000	12,146.4	0.212	0.252
18	AVON	5,315	74,580,000	14,032.0	0.062	0.046
19	AYER	6,718	63,600,000	9,467.1	0.117	0.122
20	BARNSTABLE	26,699	926,299,900	34,694.2	0.127	0.130
21	BARRE	3,983	47,970,000	12,043.7	0.054	0.089
22	BECKET	1,153	37,210,000	32,272.3	0.006	0.008
23	BEDFORD	12,314	260,500,000	21,154.8	0.096	0.105
24	BELCHERTOWN	6,361	73,510,000	11,556.4	0.091	0.101
25	BELLINGHAM	14,461	122,900,000	8,498.7	0.280	0.269
26	BELMONT	27,660	467,099,900	16,887.2	0.270	0.277
27	BERKLEY	2,300	25,020,000	10,878.3	0.035	0.034
28	BERLIN	2,280	27,770,000	12,179.8	0.031	0.028
29	BERNARDSTON	1,776	23,360,000	13,153.2	0.022	0.024
30	BEVERLY	37,382	461,600,000	12,348.2	0.499	0.513
31	BILLERICA	35,831	417,700,000	11,657.5	0.506	0.494
32	BLACKSTONE	6,486	51,520,000	7,943.3	0.135	0.131
33	BLANDFORD	954	17,650,000	18,501.0	0.008	0.009
34	BOLTON	2,427	50,950,000	20,993.0	0.019	0.021
35	BOSTON	637,986	3,831,000,000	6,004.8	17.504	17.568
36	BOURNE	11,362	257,800,000	22,689.7	0.082	0.081
37	BOXBOROUGH	2,642	47,910,000	18,134.0	0.024	0.025
38	BOXFORD	4,565	108,000,000	23,658.3	0.032	0.038

		1975 POPULATION	1978 EQUAL. VALUE	EQ. VALUE PER CAPITA	1978 % AID	1976 % AID
39	BOYLSTON	3,326	46,570,000	14,001.8	0.039	0.040
40	BRAINTREE	36,822	577,200,100	15,675.4	0.387	0.387
41	BREWSTER	3,709	197,600,000	53,275.8	0.011	0.013
42	BRIDGEWATER	13,613	152,200,000	11,180.5	0.201	0.206
43	BRIMFIELD	2,170	31,300,000	14,424.0	0.025	0.029
44	BROCKTON	95,688	843,500,000	8,815.1	1.788	1.840
45	BROOKFIELD	2,175	23,910,000	10,993.1	0.033	0.040
46	BROOKLINE	53,150	734,299,900	13,815.6	0.634	0.614
47	BUCKLAND	1,889	19,830,000	10,497.6	0.030	0.030
48	BURLINGTON	24,306	455,300,000	18,732.0	0.214	0.230
49	CAMBRIDGE	102,095	916,999,900	8,981.8	1.873	1.851
50	CANTON	18,114	277,100,000	15,297.6	0.195	0.184
51	CARLISLE	3,178	76,820,000	24,172.4	0.022	0.023
52	CARVER	4,280	70,660,000	16,509.3	0.043	0.047
53	CHARLEMONT	1,050	19,500,000	18,571.4	0.009	0.011
54	CHARLTON	5,598	59,460,000	10,621.6	0.087	0.090
55	CHATHAM	6,027	324,699,900	53,874.2	0.018	0.019
56	CHELMSFORD	31,749	422,899,900	13,320.1	0.393	0.416
57	CHELSEA	25,066	136,300,000	5,437.6	0.759	0.602
58	CHESHIRE	3,199	34,070,000	10,650.2	0.049	0.056
59	CHESTER	1,114	13,230,000	11,876.1	0.015	0.015
60	CHESTERFIELD	887	15,100,000	17,023.7	0.009	0.009
61	CHICOPEE	58,431	453,299,900	7,757.9	1.241	1.350
62	CHILMARK	401	97,820,000	243,940.1	0.000	0.000
63	CLARKSBURG	1,958	18,110,000	9,249.2	0.035	0.045
64	CLINTON	13,015	128,600,000	9,880.9	0.217	0.294
65	COHASSET	7,785	149,600,000	19,216.4	0.067	0.073
66	COLRAIN	1,493	25,650,000	17,180.2	0.014	0.013
67	CONCORD	17,270	379,300,000	21,962.9	0.130	0.146
68	CONWAY	1,152	17,680,000	15,347.2	0.012	0.012
69	CUMMINGTON	651	9,653,000	14,828.0	0.007	0.007
70	DALTON	7,504	96,770,000	12,895.8	0.096	0.107
71	DANVERS	25,007	423,399,900	16,931.3	0.243	0.246
72	DARTMOUTH	21,586	320,600,000	14,852.2	0.239	0.240
73	DEDHAM	26,924	397,200,100	14,752.6	0.301	0.303
74	DEERFIELD	4,255	78,090,000	18,352.5	0.038	0.036
75	DENNIS	9,351	471,000,000	50,368.9	0.031	0.031
76	DIGHTON	5,076	73,100,000	14,401.1	0.058	0.060
77	DOUGLAS	3,174	35,340,000	11,134.2	0.047	0.048
78	DOVER	4,923	153,000,000	31,081.4	0.000	0.000

81	DUNSTABLE	1,534	24,820,000	16,179.9	0.016	0.016
82	DUXBURY	10,601	220,800,000	20,828.2	0.084	0.096
83	EAST BRIDGEWATER	9,485	105,000,000	11,070.1	0.141	0.136
84	EAST BROOKFIELD	1,980	19,440,000	9,818.2	0.033	0.033
85	EAST LONGMEADOW	13,132	210,100,000	15,999.1	0.135	0.150
86	EASTHAM	3,069	163,300,000	53,209.5	0.010	0.009
87	EASTHAMPTON	15,084	150,800,000	9,997.3	0.249	0.255
88	EASTON	13,138	197,900,000	15,063.2	0.144	0.165
89	EDGARTOWN	2,141	210,000,000	98,085.0	0.004	0.004
90	EGREMONT	1,220	32,560,000	26,688.5	0.008	0.008
91	ERVING	1,308	81,160,000	62,048.9	0.003	0.003
92	ESSEX	2,872	50,360,000	17,534.8	0.027	0.028
93	EVERETT	39,713	709,700,000	17,870.7	0.366	0.415
94	FAIRHAVEN	16,005	143,000,000	8,934.7	0.295	0.283
95	FALL RIVER	100,339	474,000,100	4,724.0	3.499	3.414
96	FALMOUTH	20,648	596,000,000	28,864.8	0.118	0.118
97	FITCHBURG	39,070	302,800,100	7,750.2	0.831	0.828
98	FLORIDA	720	31,150,000	43,263.9	0.003	0.003
99	FOXBOROUGH	14,690	193,800,000	13,192.6	0.183	0.178
100	FRAMINGHAM	65,564	903,800,000	13,785.0	0.784	0.742
101	FRANKLIN	18,379	185,700,000	10,103.9	0.300	0.289
102	FREETOWN	5,417	93,650,000	17,288.2	0.052	0.050
103	GARDNER	19,349	137,900,000	7,127.0	0.447	0.482
104	GAY HEAD	146	22,220,000	152,191.7	0.000	0.000
105	GEORGETOWN	5,912	70,420,000	11,911.4	0.082	0.084
106	GILL	1,276	16,190,000	12,688.1	0.017	0.013
107	GLOUCESTER	27,209	382,400,000	14,054.2	0.319	0.365
108	GOSHEN	621	13,000,000	20,934.0	0.005	0.005
109	GOSNOLD	100	4,911,000	49,110.0	0.000	0.000
110	GRAFTON	10,630	113,900,000	10,715.0	0.163	0.171
111	GRANBY	5,609	55,080,000	9,819.9	0.094	0.095
112	GRANVILLE	1,183	26,330,000	22,257.0	0.009	0.010
113	GREAT BARRINGTON	7,068	103,900,000	14,700.1	0.079	0.082
114	GREENFIELD	19,087	185,200,000	9,702.9	0.324	0.317
115	GROTON	5,497	79,040,000	14,378.7	0.063	0.068
116	GROVELAND	5,253	57,580,000	10,961.4	0.079	0.080
117	HADLEY	3,802	66,230,000	17,419.8	0.036	0.033
118	HALIFAX	4,684	53,590,000	11,441.1	0.067	0.071
119	HAMILTON	6,675	117,400,000	17,588.0	0.063	0.070
120	HAMPDEN	4,751	61,210,000	12,883.6	0.061	0.066

		1975 POPULATION	1978 EQUAL. VALUE	EQ. VALUE PER CAPITA	1978 % AID	1976 % AID
121	HANCOCK	697	15,390,000	22,080.3	0.005	0.005
122	HANOVER	10,533	164,900,000	15,655.6	0.111	0.123
123	HANSON	8,331	94,640,000	11,360.0	0.121	0.124
124	HARDWICK	2,172	19,920,000	9,171.3	0.039	0.037
125	HARVARD	3,514	80,390,000	22,877.1	0.025	0.029
126	HARWICH	7,786	292,800,000	37,606.0	0.034	0.030
127	HATFIELD	3,090	37,430,000	12,113.3	0.042	0.038
128	HAVERHILL	44,399	388,999,900	8,761.5	0.835	0.745
129	HAWLEY	267	4,273,000	16,003.7	0.003	0.002
130	HEATH	423	12,400,000	29,314.4	0.002	0.002
131	HINGHAM	19,544	348,000,000	17,806.0	0.181	0.207
132	HINSDALE	1,749	22,990,000	13,144.7	0.022	0.021
133	HOLBROOK	11,849	129,900,000	10,962.9	0.178	0.193
134	HOLDEN	13,629	172,000,000	12,620.1	0.178	0.174
135	HOLLAND	1,347	29,000,000	21,529.3	0.010	0.011
136	HOLLISTON	12,921	179,900,000	13,923.1	0.153	0.169
137	HOLYOKE	46,790	262,600,000	5,612.3	1.374	1.517
138	HOPEDALE	4,014	47,700,000	11,883.4	0.056	0.057
139	HOPKINTON	6,405	111,600,000	17,423.9	0.061	0.071
140	HUBBARDSTON	1,647	22,640,000	13,746.2	0.020	0.022
141	HUDSON	16,827	169,700,000	10,085.0	0.275	0.302
142	HULL	10,572	112,100,000	10,603.5	0.164	0.178
143	HUNTINGTON	1,730	17,700,000	10,231.2	0.028	0.032
144	IPSWICH	11,551	156,800,000	13,574.6	0.140	0.158
145	KINGSTON	6,776	96,190,000	14,195.7	0.079	0.080
146	LAKEVILLE	5,118	71,920,000	14,052.4	0.060	0.060
147	LANCASTER	5,673	63,070,000	11,117.6	0.084	0.091
148	LANESBOROUGH	3,237	41,550,000	12,836.0	0.042	0.048
149	LAWRENCE	67,515	387,830,000	5,744.4	1.936	1.771
150	LEE	6,319	72,730,000	11,509.7	0.090	0.083
151	LEICESTER	8,887	74,800,000	8,416.8	0.174	0.183
152	LENOX	5,718	93,800,000	16,404.3	0.057	0.061
153	LEOMINSTER	35,429	332,300,000	9,379.3	0.622	0.606
154	LEVERETT	1,281	18,440,000	14,395.0	0.015	0.014
155	LEXINGTON	32,477	666,899,900	20,534.5	0.261	0.285
156	LEYDEN	452	8,843,000	19,564.2	0.004	0.004
157	LINCOLN	6,374	146,200,000	22,936.9	0.046	0.050
158	LITTLETON	6,629	103,200,000	15,568.0	0.070	0.066
159	LONGMEADOW	16,676	284,300,000	17,048.5	0.161	0.173
160	LOWELL	91,177	582,299,900	6,386.5	2.352	2.489

161	LUDLOW	18,183	207,100,000	11,389.8	0.263	0.293
162	LUNENBURG	8,175	100,100,000	12,244.6	0.110	0.131
163	LYNN	80,240	559,000,000	6,966.6	1.898	1.709
164	LYNNFIELD	12,009	235,500,000	19,610.3	0.101	0.113
165	MALDEN	55,814	444,900,000	7,971.1	1.154	1.115
166	MANCHESTER	5,542	141,200,000	25,478.2	0.036	0.040
167	MANSFIELD	12,447	171,200,000	13,754.3	0.149	0.146
168	MARBLEHEAD	21,574	467,899,900	21,688.1	0.164	0.176
169	MARION	3,764	100,100,000	26,594.0	0.023	0.025
170	MARLBOROUGH	30,249	342,000,100	11,306.2	0.441	0.474
171	MARSHFIELD	19,450	306,700,000	15,768.6	0.203	0.214
172	MASHPEE	2,496	154,100,000	61,738.8	0.007	0.005
173	MATTAPOISETT	5,376	93,580,000	17,407.0	0.051	0.052
174	MAYNARD	9,901	125,900,000	12,715.9	0.128	0.140
175	MEDFIELD	10,031	147,400,000	14,694.4	0.112	0.115
176	MEDFORD	60,702	585,900,000	9,652.1	1.036	1.046
177	MEDWAY	8,166	121,400,000	14,866.5	0.090	0.094
178	MELROSE	32,213	339,000,000	10,523.7	0.504	0.503
179	MENDON	2,714	39,580,000	14,583.6	0.031	0.035
180	MERRIMAC	4,202	36,800,000	8,757.7	0.079	0.078
181	METHUEN	35,516	367,099,900	10,336.2	0.566	0.574
182	MIDDLEBOROUGH	14,146	154,100,000	10,893.5	0.214	0.216
183	MIDDLEFIELD	307	7,482,000	24,371.3	0.002	0.002
184	MIDDLETON	4,032	67,570,000	16,758.4	0.040	0.039
185	MILFORD	23,366	227,500,000	9,736.4	0.395	0.406
186	MILLBURY	12,121	92,260,000	7,611.6	0.262	0.257
187	MILLIS	6,534	83,440,000	12,770.1	0.084	0.080
188	MILLVILLE	1,744	12,960,000	7,431.2	0.039	0.041
189	MILTON	27,214	380,000,000	13,963.4	0.321	0.323
190	MONROE	186	3,538,000	19,021.5	0.002	0.001
191	MONSON	7,376	68,000,000	9,219.1	0.132	0.126
192	MONTAGUE	8,321	84,180,000	10,116.6	0.136	0.140
193	MONTEREY	758	25,920,000	34,195.2	0.004	0.004
194	MONTGOMERY	600	9,433,000	15,721.7	0.006	0.006
195	MOUNT WASHINGTON	78	2,848,000	36,512.8	0.000	0.000
196	NAHANT	4,229	62,480,000	14,774.2	0.047	0.044
197	NANTUCKET	5,559	314,000,100	56,485.0	0.016	0.019
198	NATICK	31,102	479,500,000	15,417.0	0.332	0.343
199	NEEDHAM	29,936	579,446,000	19,356.2	0.255	0.255
200	NEW ASHFORD	160	8,635,000	53,968.7	0.000	0.001

		1975 POPULATION	1978 EQUAL. VALUE	EQ. VALUE PER CAPITA	1978 % AID	1976 % AID
201	NEW BEDFORD	100,345	598,728,900	5,966.7	2.771	2.187
202	NEW BRAINTREE	700	7,565,000	10,807.1	0.011	0.011
203	NEW MARLBOROUGH	1,087	33,970,000	31,251.1	0.006	0.006
204	NEW SALEM	643	8,364,000	13,007.8	0.008	0.006
205	NEWBURY	4,239	54,820,000	12,932.3	0.054	0.053
206	NEWBURYPORT	16,341	179,900,000	11,009.1	0.245	0.261
207	NEWTON	89,183	1,344,999,000	15,081.3	0.974	1.069
208	NORFOLK	5,960	76,790,000	12,884.2	0.076	0.084
209	NORTH ADAMS	18,424	118,400,000	6,426.4	0.472	0.474
210	NORTH ANDOVER	15,864	301,400,000	18,999.0	0.138	0.133
211	NORTH ATTLEBORO	19,120	226,400,000	11,841.0	0.266	0.263
212	NORTH BROOKFIELD	4,150	38,010,000	9,159.0	0.075	0.080
213	NORTH READING	12,125	168,900,000	13,929.9	0.143	0.155
214	NORTHAMPTON	27,695	269,200,100	9,720.2	0.469	0.492
215	NORTHBOROUGH	10,563	150,100,000	14,210.0	0.122	0.124
216	NORTHBRIDGE	12,165	100,600,000	8,269.6	0.242	0.267
217	NORTHFIELD	2,470	45,180,000	18,291.5	0.022	0.021
218	NORTON	9,869	128,400,000	13,010.4	0.125	0.141
219	NORWELL	8,999	140,600,000	15,624.0	0.095	0.095
220	NORWOOD	31,316	422,899,900	13,504.3	0.382	0.419
221	OAK BLUFFS	1,724	89,250,000	51,769.1	0.005	0.006
222	OAKHAM	846	13,000,000	15,366.4	0.009	0.011
223	ORANGE	6,445	44,740,000	6,941.8	0.153	0.162
224	ORLEANS	4,369	266,100,000	60,906.4	0.012	0.013
225	OTIS	898	34,530,000	38,452.1	0.004	0.005
226	OXFORD	10,822	111,000,000	10,256.9	0.174	0.251
227	PALMER	11,755	128,500,000	10,931.5	0.177	0.180
228	PAXTON	3,706	53,260,000	14,371.3	0.042	0.042
229	PEABODY	45,503	564,000,000	12,394.8	0.605	0.582
230	PELHAM	1,153	19,590,000	16,990.5	0.011	0.012
231	PEMBROKE	12,374	144,300,000	11,661.5	0.175	0.193
232	PEPPERELL	6,745	78,890,000	11,696.1	0.095	0.099
233	PERU	464	11,240,000	24,224.1	0.003	0.002
234	PETERSHAM	1,099	19,310,000	17,570.5	0.010	0.010
235	PHILLIPSTON	962	16,230,000	16,871.1	0.009	0.016
236	PITTSFIELD	55,299	602,400,000	10,893.5	0.836	0.858
237	PLAINFIELD	366	7,655,000	20,915.3	0.003	0.003
238	PLAINVILLE	5,463	79,630,000	14,576.2	0.062	0.060
239	PLYMOUTH	26,907	660,800,000	24,558.7	0.181	0.231
240	PLYMPTON	1,679	29,940,000	17,832.0	0.016	0.011

241	PRINCETON	2,072	32,260,000	15,569.5	0.022	0.026
242	PROVINCETOWN	3,947	113,800,000	28,832.0	0.023	0.022
243	QUINCY	91,487	975,500,000	10,662.7	1.414	1.488
244	RANDOLPH	29,206	318,000,100	10,888.2	0.442	0.464
245	RAYNHAM	7,720	110,300,000	14,287.6	0.089	0.093
246	READING	23,696	324,400,100	13,690.1	0.285	0.305
247	REHOBOTH	7,009	103,500,000	14,766.7	0.078	0.082
248	REVERE	41,292	349,299,900	8,459.3	0.804	0.678
249	RICHMOND	1,689	31,480,000	18,638.2	0.015	0.015
250	ROCHESTER	2,284	38,540,000	16,873.9	0.022	0.025
251	ROCKLAND	17,028	144,300,000	8,474.3	0.331	0.330
252	ROCKPORT	6,284	164,100,000	26,113.9	0.040	0.042
253	ROWE	313	125,700,000	401,597.4	0.000	0.000
254	ROWLEY	3,455	46,780,000	13,539.8	0.042	0.036
255	ROYALSTON	878	12,540,000	14,282.5	0.010	0.010
256	RUSSELL	1,580	16,070,000	10,170.9	0.026	0.024
257	RUTLAND	3,692	41,480,000	11,235.1	0.054	0.063
258	SALEM	38,545	477,499,900	12,388.1	0.513	0.494
259	SALISBURY	4,967	88,720,000	17,861.9	0.046	0.051
260	SANDISFIELD	660	16,260,000	24,636.4	0.004	0.003
261	SANDWICH	6,358	348,999,900	54,891.5	0.019	0.023
262	SAUGUS	24,716	366,099,900	14,812.3	0.275	0.278
263	SAVOY	467	9,921,000	21,244.1	0.004	0.004
264	SCITUATE	17,829	277,200,100	15,547.7	0.189	0.191
265	SEEKONK	11,351	190,400,000	16,773.9	0.111	0.113
266	SHARON	13,592	206,500,000	15,192.8	0.147	0.160
267	SHEFFIELD	2,723	53,440,000	19,625.4	0.023	0.026
268	SHELBURNE	1,976	22,820,000	11,548.6	0.028	0.026
269	SHERBORN	4,116	94,120,000	22,866.9	0.030	0.030
270	SHIRLEY	4,740	36,000,000	7,594.9	0.103	0.119
271	SHREWSBURY	21,965	279,600,100	12,729.3	0.284	0.292
272	SHUTESBURY	790	17,520,000	22,177.2	0.006	0.007
273	SOMERSET	19,205	511,500,000	26,633.7	0.119	0.117
274	SOMERVILLE	80,596	518,000,100	6,427.1	2.066	1.938
275	SOUTH HADLEY	16,568	173,200,000	10,453.9	0.261	0.280
276	SOUTHAMPTON	3,770	49,400,000	13,103.4	0.047	0.052
277	SOUTHBOROUGH	6,326	126,600,000	20,012.6	0.052	0.055
278	SOUTHBRIDGE	16,910	133,100,000	7,871.1	0.354	0.345
279	SOUTHWICK	7,028	79,310,000	11,284.9	0.103	0.106
280	SPENCER	9,895	80,150,000	8,100.0	0.201	0.208

		1975 POPULATION	1978 EQUAL. VALUE	EQ. VALUE PER CAPITA	1978 % AID	1976 % AID
281	SPRINGFIELD	168,785	1,037,299,000	6,145.7	4.525	4.435
282	STERLING	4,901	74,600,000	15,221.4	0.053	0.067
283	STOCKBRIDGE	2,228	58,400,000	26,211.8	0.014	0.016
284	STONEHAM	21,564	301,799,900	13,995.5	0.254	0.276
285	STOUGHTON	25,717	326,800,100	12,707.6	0.333	0.351
286	STOW	4,688	80,600,000	17,192.8	0.045	0.043
287	STURBRIDGE	5,522	87,420,000	15,831.2	0.057	0.060
288	SUDBURY	14,951	294,400,000	19,691.0	0.125	0.130
289	SUNDERLAND	2,763	36,470,000	13,199.4	0.034	0.032
290	SUTTON	4,969	63,750,000	12,829.5	0.064	0.065
291	SWAMPSCOTT	14,329	223,200,000	15,576.8	0.152	0.152
292	SWANSEA	15,052	170,100,000	11,300.8	0.219	0.219
293	TAUNTON	42,148	313,200,100	7,431.0	0.934	0.801
294	TEMPLETON	6,079	53,310,000	8,769.5	0.114	0.143
295	TEWKSBURY	24,049	287,200,000	11,942.3	0.332	0.312
296	TISBURY	2,754	100,300,000	36,419.7	0.012	0.013
297	TOLLAND	215	16,430,000	76,418.6	0.000	0.000
298	TOPSFIELD	5,913	109,700,000	18,552.3	0.053	0.062
299	TOWNSEND	5,125	64,040,000	12,495.6	0.068	0.086
300	TRURO	1,260	94,150,000	74,722.2	0.003	0.003
301	TYNGSBOROUGH	4,870	64,000,000	13,141.7	0.061	0.070
302	TYRINGHAM	328	13,450,000	41,006.1	0.001	0.002
303	UPTON	3,777	37,820,000	10,013.2	0.062	0.058
304	UXBRIDGE	8,528	77,750,000	9,117.0	0.154	0.145
305	WAKEFIELD	26,041	330,700,000	12,699.2	0.338	0.376
306	WALES	1,033	13,050,000	12,633.1	0.013	0.015
307	WALPOLE	18,504	267,900,000	14,477.9	0.211	0.206
308	WALTHAM	56,757	810,000,100	14,271.4	0.655	0.690
309	WARE	8,679	76,940,000	8,865.1	0.161	0.155
310	WAREHAM	15,078	244,200,000	16,195.8	0.153	0.158
311	WARREN	3,456	30,000,000	8,680.6	0.066	0.062
312	WARWICK	582	10,600,000	18,213.1	0.005	0.007
313	WASHINGTON	486	8,752,000	18,008.2	0.004	0.004
314	WATERTOWN	36,075	416,999,900	11,559.2	0.514	0.538
315	WAYLAND	13,282	259,600,000	19,545.2	0.112	0.125
316	WEBSTER	14,444	109,400,000	7,574.1	0.314	0.313
317	WELLESLEY	26,593	608,900,000	22,897.0	0.191	0.211
318	WELLFLEET	1,973	168,100,000	85,200.2	0.004	0.005
319	WENDELL	631	12,210,000	19,350.2	0.005	0.008
320	WENHAM	3,359	68,590,000	20,419.8	0.027	0.029

321	WEST BOYLSTON	6,284	86,640,000	13,787.4	0.075	0.080
322	WEST BRIDGEWATER	6,429	82,270,000	12,796.7	0.083	0.075
323	WEST BROOKFIELD	2,927	39,380,000	13,454.0	0.036	0.038
324	WEST NEWBURY	2,626	39,140,000	14,904.8	0.029	0.031
325	WEST SPRINGFIELD	28,249	385,299,900	13,639.4	0.341	0.332
326	WEST STOCKBRIDGE	1,355	22,540,000	16,634.7	0.013	0.012
327	WEST TISBURY	685	30,820,000	44,992.7	0.003	0.003
328	WESTBOROUGH	13,954	228,900,000	16,403.9	0.140	0.151
329	WESTFIELD	32,863	390,599,900	11,885.7	0.456	0.456
330	WESTFORD	12,951	168,400,000	13,002.9	0.164	0.178
331	WESTHAMPTON	946	21,080,000	22,283.3	0.007	0.008
332	WESTMINSTER	4,525	87,910,000	19,427.6	0.038	0.047
333	WESTON	11,478	316,400,100	27,565.8	0.069	0.073
334	WESTPORT	12,636	188,000,000	14,878.1	0.140	0.161
335	WESTWOOD	14,019	296,699,900	21,164.1	0.109	0.117
336	WEYMOUTH	56,854	626,200,000	11,014.2	0.850	0.870
337	WHATELY	1,171	19,950,000	17,036.7	0.011	0.011
338	WHITMAN	13,476	135,200,000	10,032.6	0.221	0.245
339	WILBRAHAM	13,139	192,700,000	14,666.3	0.148	0.166
340	WILLIAMSBURG	2,292	25,400,000	11,082.0	0.034	0.038
341	WILLIAMSTOWN	8,247	105,400,000	12,780.4	0.106	0.115
342	WILMINGTON	17,656	280,499,900	15,886.9	0.183	0.178
343	WINCHENDON	6,855	49,080,000	7,159.7	0.158	0.166
344	WINCHESTER	22,672	368,400,100	16,249.1	0.230	0.239
345	WINDSOR	569	13,170,000	23,145.9	0.004	0.005
346	WINTHROP	20,359	181,800,000	8,929.7	0.376	0.431
347	WOBURN	35,329	520,699,900	14,738.6	0.395	0.460
348	WORCESTER	172,342	1,140,999,000	6,620.6	4.289	3.702
349	WORTHINGTON	810	18,880,000	23,308.6	0.006	0.006
350	WRENTHAM	7,342	89,720,000	12,220.1	0.099	0.115
351	YARMOUTH	17,427	503,600,100	28,897.7	0.099	0.107
STATE TOTALS		5,789,478	$68,613,230,000		100.0	100.0
STATE AVERAGES		16,494	195,479,300	11,851.4		

V. SIMULATING REVALUATIONS

Calculating Estimates

The problem and solution of equilibrium tax and value estimation have been described for the general case in Chapter 3. Here we summarize the calculation methods and illustrate them with an example.

Let us postpone, for the moment, the calculation of equilibrium value tax base and tax rate, and examine the steps for determining individual property or property group values and taxes. Our basic relationship is:

$$V = \frac{R-T}{c} \qquad (1)$$

where V = the market Value of a property or property category

T = the annual Tax bill for the property or category

R = net annual Return before Taxes for income properties or, the other side of the same coin, imputed Rent for owner-occupied residences. When viewed as Rent, R is taken to be the sum of annual mortgage and tax payments figured as if the entire market Value purchase price were financed.

c = the Capitalization rate. We have arbitrarily (but we think not too unreasonably) assumed capitalization rates of 10.4 percent for one, two, and three family homes and 12 percent for all other realty. The 10.4 percent figure is the annual constant payment rate for an amount mortgaged for twenty years at 8½ percent.

The first step is to calculate:

$$R = cV + T \qquad (2)$$

where both V and T are at current levels. Next we return to equation (1) to figure the equilibrium property value. Although the tax bill "T" is yet to be determined, we assume (for present purposes) that we know the final tax rate

"t". We rephrase equation (1) by replacing the tax bill in the numerator with a tax rate in the denominator. In the general case for 100 percent valuation or Chapter 580 classification, this is equation (15) from Chapter 3:

$$V_{iE} = \frac{(R_i + tB_i)}{(c_i + p_i t)} \qquad (3)$$

where "p" is the prescribed assessment percentage and "B" is the exemption from assessed value for property or property type "i". Assessed values would be figured as $p_i V_i$ - B so classification tax bills would be:

$$T_i = t\,(p_i V_i - B_i) \qquad (4)$$

Here is how these steps apply to Boston's "new" office properties. The average "per square foot" initial figures are:

Market Value V = \$59.27

Tax Bill T = \$ 2.10

capitalization rate c = .12

For equalization under Chapter 580 classification the equilibrium tax base nominal rate was \$178.84

tax rate t = .17884

Calculating "Return":

$$R = (.12) \times (\$59.27) + (\$2.10) = \$9.21$$

Equilibrium value is:

$$V_E = \frac{(\$9.21) + 0}{(.12) + (.5) \times (.17884)} = \$43.98$$

so that assessed value is:

$$AV = (.5) \times (\$43.98) - 0 = \$21.99$$

and taxes are now:

$$T = (.17884) \times ((.5) \times (\$43.98) - 0) = \$3.93$$

These are the results that we saw in Table 5-7 of Volume I.

In this example both property tax and market value have changed. If the tax levy and all other parameters were to remain unchanged, and if all taxable property were to capitalize tax changes in exactly the same way, then every tax and value change would be offset by a balancing change somewhere else in the tax base. In this special case the aggregate tax base and the tax rate would remain constant throughout the adjustment process. For the more general case where capitalization occurs differently among different types of property, the equilibrium tax base and rate will change from initial levels.

Since the tax rate and market value tax base are interdependent, we have calculated them simultaneously using a series of successive approximations and the definition that the effective tax rate is equal to the tax levy divided by sum of taxable market values:

$$e = \frac{L}{V_{pp} + \sum_{i=1}^{n} \frac{R_i}{c_i + e}} \qquad (5)$$

where L = the property tax levy

V_{pp} = the Value of personal property (assumed to be independent of property taxes)

n = the number of properties or property types

R,e, and c are Return, effective tax rate, and capitalization rate

Inserting the pre-capitalization effective tax rate as "e" in the right side of the equation (5) we calculate a new "e". If these two values of "e" differ by more than a hundredth of a percent, we repeat the procedure, inserting

the new "e" into the right side of the equation. Eventually (generally after about a half dozen repetitions) successive values of "e" came into close agreement. We can now use this approximation of the effective tax rate along with the other observed and assumed parameters to figure post-capitalization equilibrium values and taxes for individual properties or classes via our earlier formulae.

To simulate the application of Chapter 580 classification, we must expand the notation of equation (5) to:

$$t = \frac{L}{V_{pp} + \sum_{i=1}^{n} \frac{(R_i + tB_i)\, p_i}{c_i + p_i t} - B_i} \qquad (6)$$

We will not walk through the iterative steps of this laborious process here. Instead, let us examine the output from the computer program that accomplished the task for us.

Interpreting MASSTAX Output

The program MASSTAX, written in PL/I by Karl Sittler, uses our data base, as described in Chapter 2, to perform simulations of property tax equalization. The calculation procedures are as we have just described. In addition to the data adjustments related in Chapter 2, we assumed all vacant land in cities and towns over 25,000 population would be classified as residential and assessed accordingly for Chapter 580 classification. For cities and towns under 25,000, it was assumed that all vacant land is assessed as open space. We further assumed that the valuation of mixed use residential/commercial property was evenly divided into the Residential and Commercial classes, and thus applied a Chapter 580 assessment fraction of 45 percent to it.

To accommodate the utility "hold harmless" provision of Chapter 580, we took as our final result the average of two separate runs. In the first of these (labeled "Personal Property Hold Harmless"), all personality was removed from the tax base and its current bill was removed from the levy. In the second, personal property was simply assessed at "full value" and entered the tax base in the normal manner. This procedure was intended to reflect the fact that not all personal property belongs to the utilities.

The computer reports consisted of two pages for each community and population group. One expressed aggregate outcomes with all dollar figures in $1,000s, and the other presented parcel averages for realty. Each page contained three sets of rows. First was the Fiscal Year 1978 base data, along with the 100 percent valuation initial impact taxes and resulting changes from actual FY78 levels. Second was a set of initial impact estimates for the equalization being simulated, along with indication of tax changes from actual and 100 percent initial impact levels. Finally, we listed equilibrium results and changes from actual and initial impact taxes. This is illustrated in the following examples. Further examples may be found at the end of Volume III.

The "Tax Change" figure in the "Tax Rate & Shifts" column is the sum of all positive tax changes across all property types. This is a measure of overall disruption of existing tax patterns. Population group and state totals represent sums of individual results across communities .

MASSACHUSETTS PROPERTY TAX SUMMARY: 1978 BASE DATA — PAGE NO. 1 — PREPARED BY: TAX POLICY STUDY GROUP
ALL CITIES AND TOWNS (1978 YEAR AI 2.54) — DATE: 82/06/08

CITY OR TOWN: 035 BOSTON — 1976 LEVY: $441,311,000 — AS PERCENT OF INCOME: 16.03 — PER CAPITA INCOME: $4,157
LEVY SHORTFALL:

CLASSIFICATION SUMMARY (PERSONAL PROPERTY HELD HARMLESS)

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN RB INITIAL	R1,R2,R3,R4	$2,692,632,000	$378,065,000	$698,998,000	$46.35	25.95
	RL	$295,818,000	$0	$133,118,000	$83.82	44.99
	C	$1,722,916,000	$0	$861,458,000	$93.14	50.00
	I	$419,339,000	$0	$230,636,000	$102.45	54.99
	AH	$74,000	$0	$74,000	$186.28	100.00
	L	$273,694,000	$0	$109,478,000	$74.51	39.99
	P	$471,088,000	$0	$335,277,000	$132.57	71.17
PLAN RB EQUIL.	R1,R2,R3,R4	$2,795,969,000	$378,065,000	$740,322,000	$49.34	26.47
	RC	$252,752,000	$0	$113,738,000	$83.86	44.99
	C	$1,719,121,000	$0	$859,561,000	$93.18	50.00
	I	$419,127,000	$0	$230,520,000	$102.50	54.99
	AH	$90,000	$0	$90,000	$186.37	100.00
	L	$221,230,000	$0	$88,494,000	$74.54	39.99
	P	$471,088,000	$0	$335,108,000	$132.57	71.13

TAX BILL SUMMARY: ALL $ FIGURES X $1000. — ITERATIONS: 6

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HOR. AH	LAND L	PERSONAL P
# PARCELS	95851	31414	19612	16867	7720	2566	6070	1002	3	10597	0
AV/EV RATIO	29.69	16.04	18.58	24.15	34.25	21.42	36.66	40.48	100.00	14.73	52.42
AV	$1745000	$169601	$112393	$101480	$209341	$63385	$631657	$169763	$74	$40325	$246961
EV	$58755611	$1056782	$604670	$420096	$611084	$295818	$1722916	$419339	$74	$273694	$471088
TAXES	$252.89	$42892	$28424	$25664	$52942	$16030	$159746	$42938	$18	$10198	$62456
100% TAXES	$70.09	$74080	$42387	$29448	$42836	$20736	$120776	$29395	$5	$19165	$62456
TAX CHANGE	$62630	$31188	$13963	$3784	$10105-	$4706	$36969-	$13542-	$13-	$8967	$0
% CHANGE	14.19	72.71	49.12	14.74	-19.08	29.36	-24.39	-31.53	-72.28	88.13	0.00
EXEMPTIONS	$378065	$157070	$98060	$84335	$38600	$0	$0	$0	$0	$0	$0
PLAN RB INITIAL											
ADJUSTED AV	$2369029	$265642	$143807	$83703	$205833	$133116	$861458	$230636	$74	$109477	$335277
NEW TAXES	$186.28	$49484	$26788	$15592	$38343	$24797	$160474	$42963	$13	$20393	$62456
TAX CHANGE	$26310	$6592	$1635-	$10071-	$14599-	$8767	$728	$25	$4-	$10195	$0
% CHANGE	5.96	15.37	-5.75	-39.24	-27.57	54.69	0.45	0.05	-26.34	99.97	0.00
TC (100%)	$58543	$24595-	$15598-	$13856-	$4493-	$4060	$39698	$13567	$8	$1207	$0
% CHANGE	13.26	-33.20	-36.79	-47.05	-10.49	19.56	32.06	46.15	165.74	6.29	0.00
PLAN RB EQUILIBRIUM											
ADJUSTED AV	$2367633	$250819	$147442	$106250	$235810	$113738	$859560	$230520	$90	$88494	$335108
NEW TAXES	$186.37	$46746	$27479	$19802	$43949	$21198	$160202	$42963	$16	$16495	$62456
TAX CHANGE	$15799	$3854	$944-	$5861-	$8992-	$5108	$456	$25	$1-	$6295	$0
% CHANGE	3.58	8.98	-3.32	-22.83	-16.98	32.24	0.28	0.05	-10.30	61.72	0.00
TC (INIT)	$10510	$2737-	$690	$4210	$5606	$3599-	$272-	$0	$3	$3900-	$0
% CHANGE	2.38	-5.53	2.57	27.00	14.62	-14.51	-0.16	0.00	21.77	-19.12	0.00

CLASSIFICATION SUMMARY (PERSONAL PROPERTY HELD HARMLESS)

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN RB INITIAL	R1,R2,R3,R4	$2,692,632,000	$378,065,000	$698,968,000	$48.35	25.95
	RC	$295,818,000	$0	$133,118,000	$83.82	44.99
	C	$1,722,916,000	$0	$861,456,000	$93.14	50.00
	I	$419,339,000	$0	$230,636,000	$102.45	54.99
	AH	$74,000	$0	$74,000	$186.28	100.00
	L	$273,694,000	$0	$109,478,000	$74.51	39.99
	P	$471,088,000	$0	$335,277,000	$132.57	71.17
PLAN RB EQUIL.	R1,R2,R3,R4	$2,795,969,000	$378,065,000	$740,322,000	$49.34	26.47
	RC	$252,752,000	$0	$113,738,000	$83.86	44.99
	C	$1,719,121,000	$0	$859,561,000	$93.18	50.00
	I	$419,127,000	$0	$230,520,000	$102.50	54.99
	AH	$90,000	$0	$90,000	$186.37	100.00
	L	$221,236,000	$0	$88,494,000	$74.54	39.99
	P	$471,088,000	$0	$335,108,000	$132.57	71.13

TAX BILL SUMMARY: TOTALS & PERSONAL PROPERTY - X $1000. ALL OTHER FIGURES ARE PARCEL AVERAGES. ITERATIONS: 6

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HOR. AH	LAND L	PERSONAL P
# PARCELS	95851	31414	19612	16867	7720	2566	6070	1002	3	10597	0
AV/EV RATIO	29.69	16.04	18.58	24.15	34.25	21.42	36.66	40.48	100.00	14.73	52.42
AV	$1745000	$5398	$5730	$6016	$27116	$24701	$104062	$169444	$24666	$3805	$246961
EV	$5875561	$33640	$30831	$24906	$79155	$115283	$283841	$418501	$24666	$25827	$471088
TAXES	$252.89	$1365	$1449	$1521	$6857	$6247	$26317	$42852	$6236	$962	$62456
100% TAXES	$70.09	$2358	$2161	$1745	$5548	$8081	$19897	$29336	$1729	$1810	$62456
TAX CHANGE	$62630	$992	$711	$224	$1308-	$1834	$6420-	$13515-	$4509-	$848	$0
% CHANGE	14.19	72.71	49.12	14.74	-19.08	29.36	-24.39	-31.53	-72.28	88.13	0.00
EXEMPTIONS	$378065	$5000	$5000	$5000	$5000	$0	$0	$0	$0	$0	$0
PLAN RB INITIAL											
ADJUSTED AV	$2369029	$8456	$7532	$4962	$26662	$51877	$141920	$230176	$24666	$10330	$335277
NEW TAXES	$186.28	$1575	$1365	$924	$4966	$9663	$26437	$42877	$4594	$1924	$62456
TAX CHANGE	$26310	$209	$63-	$597-	$1891-	$3416	$120	$25	$1643-	$962	$0
% CHANGE	5.96	15.37	-5.75	-39.24	-27.57	54.69	0.45	0.05	-26.34	99.97	0.00
TC (100%)	$58543	$782-	$795-	$821-	$582-	$1582	$6540	$13540	$2865	$113	$0
% CHANGE	15.26	-33.20	-36.79	-47.05	-10.49	19.58	32.86	46.15	165.74	6.29	0.00
PLAN RB EQUILIBRIUM											
ADJUSTED AV	$2367833	$7984	$7517	$6299	$30545	$44325	$141607	$230059	$30020	$6350	$335108
NEW TAXES	$186.37	$1488	$1401	$1174	$5692	$8261	$26392	$42877	$5595	$1556	$62456
TAX CHANGE	$15799	$122	$48-	$347-	$1164-	$2014	$75	$25	$643-	$594	$0
% CHANGE	3.56	8.98	-3.32	-22.83	-16.98	32.24	0.28	0.05	-10.30	61.72	0.00
TC (INIT)	$10510	$87-	$35	$249	$726	$1402-	$44-	$0	$1000	$368-	$0
% CHANGE	2.38	-5.53	2.57	27.00	14.62	-14.51	-0.16	0.00	21.77	-19.14	0.00

MASSACHUSETTS PROPERTY TAX SUMMARY: 1978 BASE DATA — PAGE NO. 14 — PREPARED BY: TAX POLICY STUDY GROUP
ALL CITIES AND TOWNS (1978 YEAR AT 2.5%) — 2 5 — DATE: 82/06/08

CITY OR TOWN: 035 BOSTON — 1978 LEVY: $441,311,000 — AS PERCENT OF INCOME: 16.63 — PER CAPITA INCOME: $4,157
LEVY SHORTFALL:

CLASSIFICATION SUMMARY

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN RB INITIAL	R1,R2,R3,R4	$2,692,632,000	$378,065,000	$698,988,000	$45.73	25.95
	RC	$295,818,000	$0	$133,118,000	$79.28	44.99
	C	$1,722,916,000	$0	$861,458,000	$88.09	50.00
	I	$419,339,000	$0	$230,636,000	$96.89	54.99
	AH	$74,000	$0	$74,000	$176.18	100.00
	L	$273,694,000	$0	$109,478,000	$70.47	39.99
	P	$471,088,000	$0	$471,088,000	$176.18	100.00
PLAN RB EQUIL.	R1,R2,R3,R4	$2,858,875,000	$378,065,000	$765,485,000	$45.86	26.77
	RC	$261,448,000	$0	$117,652,000	$77.08	44.99
	C	$1,782,109,000	$0	$891,054,000	$85.65	50.00
	I	$435,343,000	$0	$239,439,000	$94.21	54.99
	AH	$95,000	$0	$95,000	$171.30	100.00
	L	$228,309,000	$0	$91,324,000	$68.52	39.99
	P	$471,088,000	$0	$471,088,000	$171.30	100.00

TAX BILL SUMMARY: TOTALS & PERSONAL PROPERTY - X $1000. ALL OTHER FIGURES ARE PARCEL AVERAGES. — ITERATIONS: 8

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HOR. AH	LAND L	PERSONAL P
# PARCELS	95651	31414	19612	16867	7720	2566	6070	1002	3	10597	0
AV/EV RATIO	29.69	16.04	18.58	24.15	34.25	21.42	36.66	40.48	100.00	14.73	52.42
AV	$1745000	$5398	$5730	$6018	$27116	$24701	$104062	$169444	$24666	$3805	$246961
EV	$5875561	$33640	$30831	$24906	$79155	$115283	$283841	$418501	$24666	$25827	$471088
TAXES	$252.89	$1365	$1449	$1521	$6857	$6247	$26317	$42852	$6238	$962	$62456
100% TAXES	$75.10	$2526	$2315	$1870	$5945	$8658	$21319	$31433	$1852	$1939	$35382
TAX CHANGE	$75909	$1161	$866	$349	$912-	$2411	$4998-	$11419-	$4385-	$977	$27073-
% CHANGE	17.20	65.05	59.77	22.94	-13.30	38.60	-18.99	-26.64	-70.30	101.57	-43.34
EXEMPTIONS	$3780655	$5000	$5000	$5000	$5000	$0	$0	$0	$0	$0	$0
PLAN RB	INITIAL										
ADJUSTED AV	$2504839	$8456	$7352	$4962	$26662	$51877	$141920	$230176	$24666	$10330	$471088
NEW TAXES	$176.18	$1489	$1291	$874	$4697	$9139	$25003	$40553	$4345	$1820	$82997
TAX CHANGE	$40963	$124	$157-	$647-	$2160-	$2892	$1313-	$2299-	$1892-	$857	$20541
% CHANGE	9.28	9.11	-10.76	-42.53	-31.50	46.30	-4.99	-5.36	-30.33	89.13	32.88
TC (100%)	$80362	$1036-	$1023-	$996-	$1247-	$481	$3684	$9119	$2493	$119-	$47614
% CHANGE	18.21	-41.03	-44.21	-53.26	-20.98	5.55	17.28	29.01	134.56	-6.17	134.56
PLAN RB	EQUILIBRIUM										
ADJUSTED AV	$2876135	$9265	$7780	$6519	$31521	$45850	$146796	$238960	$31573	$8617	$471088
NEW TAXES	$171.30	$1419	$1332	$1116	$5399	$7854	$25147	$40935	$5408	$1476	$80701
TAX CHANGE	$29341	$50	$116-	$404-	$1457-	$1607	$1169-	$1916-	$829-	$513	$18244
% CHANGE	6.66	3.67	-1.63	-26.60	-21.25	25.73	-4.44	-4.47	-13.29	53.40	29.21
TC (INIT)	$11574	$74-	$40	$242	$702	$1285-	$143	$362	$1063	$343-	$2296-
% CHANGE	2.62	-4.96	3.17	27.73	14.95	-14.06	0.57	0.94	24.46	-18.89	-2.76

CITY OR TOWN: 035 BOSTON 1978 LEVY: $441,311,000 AS PERCENT OF INCOME: 16.63 PER CAPITA INCOME: $4,157
LEVY SHORTFALL:

CLASSIFICATION SUMMARY

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN RR INITIAL	R1,R2,R3,R4	$2,692,632,000	$378,065,000	$698,988,000	$45.73	25.95
	RC	$295,818,000	$0	$133,118,000	$79.28	44.99
	C	$1,722,916,000	$0	$861,458,000	$88.09	50.00
	I	$419,339,000	$0	$230,636,000	$96.89	54.99
	AH	$74,000	$0	$74,000	$176.18	100.00
	L	$273,694,000	$0	$109,478,000	$70.47	39.99
	P	$471,088,000	$0	$471,088,000	$176.18	100.00
PLAN RB EQUIL.	R1,R2,R3,R4	$2,858,875,000	$378,065,000	$765,485,000	$45.86	26.77
	RC	$261,448,000	$0	$117,652,000	$77.08	44.99
	C	$1,782,109,000	$0	$891,054,000	$85.65	50.00
	I	$435,343,000	$0	$239,439,000	$94.21	54.99
	AH	$95,000	$0	$95,000	$171.30	100.00
	L	$228,309,000	$0	$91,324,000	$68.52	39.99
	P	$471,088,000	$0	$471,088,000	$171.30	100.00

TAX BILL SUMMARY: ALL $ FIGURES X $1000. ITERATIONS: 8

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HOR. AH	LAND L	PERSONAL P
# PARCELS	95851	31414	19612	16867	7720	2566	6070	1002	3	10597	0
AV/EV RATIO	29.69	16.04	18.58	24.15	34.25	21.42	36.66	40.48	100.00	14.73	52.42
AV	$17450000	$169601	$112393	$101480	$209341	$63385	$631657	$169783	$74	$40325	$246961
EV	$58755610	$1056782	$604670	$420096	$611084	$295818	$1722916	$419339	$74	$273694	$471088
TAXES	$2,52.89	$42892	$28424	$25664	$52942	$16030	$159746	$42938	$18	$10198	$62456
100% TAXES	$75.10	$79373	$45416	$31552	$45897	$22218	$129406	$31496	$5	$20556	$35382
TAX CHANGE	175909	$36481	$16991	$5888	$7044-	$6188	$30339-	$11441-	$13-	$10358	$27073-
% CHANGE	17.20	85.05	59.77	22.94	-13.30	38.60	-18.99	-26.64	-70.30	101.57	-43.34
EXEMPTIONS	$3780651	$157070	$98060	$84335	$38600	$0	$0	$0	$0	$0	$0
PLAN RR INITIAL											
ADJUSTED AV	$2504839	$265642	$143807	$83703	$205833	$133118	$861458	$230636	$74	$109477	$471088
NEW TAXES	$176.18	$46801	$25336	$14747	$36264	$23453	$151774	$40634	$13	$19288	$82997
TAX CHANGE	$40963	$3909	$3087-	$10917-	$16677-	$7423	$7971-	$2303-	$5-	$9089	$20541
% CHANGE	9.28	9.11	-10.86	-42.53	-31.50	46.30	-4.99	-5.36	-30.33	89.13	32.88
TC (100%)	180362	$32572-	$20079-	$16005-	$9633-	$1234	$22367	$9138	$7	$1268-	$47614
% CHANGE	18.21	-41.03	-44.21	-53.26	-20.98	5.55	17.28	29.01	134.56	-6.17	134.56
PLAN RB EQUILIBRIUM											
ADJUSTED AV	$2576135	$259581	$152592	$109961	$243349	$117651	$891054	$239438	$94	$91323	$471088
NEW TAXES	$171.30	$44468	$26140	$18837	$41687	$20154	$152644	$41017	$16	$15644	$80701
TAX CHANGE	129391	$1576	$2283-	$6826-	$11254-	$4124	$7101-	$1920-	$2-	$5446	$18244
% CHANGE	6.66	3.67	-8.03	-26.60	-21.25	25.73	-4.44	-4.47	-13.29	53.40	29.21
TC (INIT)	111574	$2333-	$803	$4090	$5423	$3298-	$870	$383	$3	$3643-	$2296-
% CHANGE	2.62	-4.98	3.17	27.73	14.95	-14.06	0.57	0.94	24.46	-18.89	-2.76

MASSACHUSETTS PROPERTY TAX SUMMARY: 1978 BASE DATA — PAGE NO. 11 — PREPARED BY: TAX POLICY STUDY GROUP
ALL CITIES AND TOWNS (ZEROTH YEAR AT 2.5%) — ONEHUN — DATE: 78/10/16

CITY OR TOWN: STATE TOTALS — 1978 LEVY: $2,960,158,000 — AS PERCENT OF INCOME: 8.63 — PER CAPITA INCOME: $5,945
LEVY SHORTFALL: $0

CLASSIFICATION SUMMARY — TOTAL CITIES & TOWNS: 343; AT OR BELOW 2.5%: 101

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN JA1 INITIAL	R1,R2,R3,R4	$55,060,210,000	$0	$55,060,210,000	$32.50	100.00
	RC	$1,151,886,000	$0	$1,151,886,000	$32.50	100.00
	C	$8,755,384,000	$0	$8,755,384,000	$32.50	100.00
	I	$4,501,370,000	$0	$4,501,370,000	$32.50	100.00
	AH	$66,502,000	$0	$66,502,000	$32.50	100.00
	L	$3,882,336,000	$0	$3,882,336,000	$32.50	100.00
	P	$4,038,939,000	$0	$4,038,939,000	$32.50	100.00
PLAN JA1 EQUIL.	R1,R2,R3,R4	$53,337,182,000	$0	$53,337,182,000	$32.55	100.00
	RC	$1,139,446,000	$0	$1,139,446,000	$32.55	100.00
	C	$9,200,042,000	$0	$9,200,042,000	$32.55	100.00
	I	$4,887,545,000	$0	$4,887,545,000	$32.55	100.00
	AH	$75,867,000	$0	$75,867,000	$32.55	100.00
	L	$3,623,149,000	$0	$3,623,149,000	$32.55	100.00
	P	$4,038,939,000	$0	$4,038,939,000	$32.55	100.00

TAX BILL SUMMARY: ALL $ FIGURES X $1000.

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HORT. AH	LAND L	PERSONAL P
# PARCELS	1799153	1068261	146759	62575	39038	17920	64873	12691	3725	383311	0
AV/EV RATIO	48.63	47.11	36.48	35.07	48.13	47.51	54.32	60.62	89.12	41.61	68.12
AV	$37668239	$20916588	$1916340	$617405	$1759522	$547275	$4755978	$2728971	$59267	$1615497	$2751396
EV	$77456625	$44392125	$5252791	$1760078	$3655214	$1151885	$8755383	$4501369	$66501	$3882335	$4038939
TAXES	$78.58	$1336138	$199386	$85535	$188980	$50168	$491652	$249040	$3298	$86392	$269544
100% TAXES	$38.21	$1527529	$243165	$98037	$173238	$52023	$401955	$179020	$1872	$127909	$155362
TAX CHANGE +	$306602	$193056	$44985	$14491	$3266	$7016	$769	$156	$0	$42813	$45
TAX CHANGE -	$306625-	$1665-	$1206-	$1989-	$19008-	$5161-	$90466-	$70177-	$1425-	$1296-	$114226-
NET % CHANGE	10.35	14.32	21.95	14.61	-8.33	3.69	-18.24	-28.11	-43.22	46.05	-42.36
PLAN JA1 INITIAL											
ADJUSTED AV	$77456625	$44392125	$5252791	$1760078	$3655214	$1151885	$8755383	$4501369	$66501	$3882335	$4038939
NEW TAXES	$38.21	$1527529	$243165	$98037	$173238	$52023	$401955	$179020	$1872	$127909	$155362
TAX CHANGE +	$306602	$193056	$44985	$14491	$3266	$7016	$769	$156	$0	$42813	$45
TAX CHANGE -	$306625-	$1665-	$1206-	$1989-	$19008-	$5161-	$90466-	$70177-	$1425-	$1296-	$114226-
NET % CHANGE	10.35	14.32	21.95	14.61	-8.33	3.69	-18.24	-28.11	-43.22	46.05	-42.36
TC (100%) +	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TC (100%) -	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET % CHANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLAN JA1 EQUILIBRIUM											
ADJUSTED AV	$76302169	$43014522	$4944540	$1663531	$3714586	$1139445	$9200042	$4887544	$75866	$3623148	$4038939
NEW TAXES	$38.79	$1479416	$231444	$95576	$181856	$51681	$430294	$202700	$2174	$117495	$159487
TAX CHANGE +	$229356	$144484	$32865	$11063	$3037	$4987	$691	$160	$0	$32020	$45
TAX CHANGE -	$229385-	$1205-	$807-	$1023-	$10162-	$3445-	$54041-	$46503-	$1123-	$917-	$110101-

CITY OR TOWN: STATE TOTALS 1978 LEVY: $2,960,158,000 AS PERCENT OF INCOME: 8.63 PER CAPITA INCOME: $5,945

LEVY SHORTFALL: $0

CLASSIFICATION SUMMARY TOTAL CITIES & TOWNS: 343; AT OR BELOW 2.5%: 101

CLASS. SCHEME	PROPERTY CLASSES	EQUALIZED VALUE	TOTAL EXEMPTIONS	A.V. ADJUSTED CLASS & EXEMPT	EQUALIZED CLASS TAX RATE	% ASSESS. AT OVERALL RATE
PLAN JA1 INITIAL	R1,R2,R3,R4	$55,060,210,000	$0	$55,060,210,000	$32.50	100.00
	RC	$1,151,886,000	$0	$1,151,886,000	$32.50	100.00
	C	$8,755,384,000	$0	$8,755,384,000	$32.50	100.00
	I	$4,501,370,000	$0	$4,501,370,000	$32.50	100.00
	AH	$66,502,000	$0	$66,502,000	$32.50	100.00
	L	$3,882,336,000	$0	$3,882,336,000	$32.50	100.00
	P	$4,038,939,000	$0	$4,038,939,000	$32.50	100.00
PLAN JA1 EQUIL.	R1,R2,R3,R4	$53,337,182,000	$0	$53,337,182,000	$32.55	100.00
	RC	$1,139,446,000	$0	$1,139,446,000	$32.55	100.00
	C	$9,200,042,000	$0	$9,200,042,000	$32.55	100.00
	I	$4,887,545,000	$0	$4,887,545,000	$32.55	100.00
	AH	$75,867,000	$0	$75,867,000	$32.55	100.00
	L	$3,623,149,000	$0	$3,623,149,000	$32.55	100.00
	P	$4,038,939,000	$0	$4,038,939,000	$32.55	100.00

TAX BILL SUMMARY: TOTALS & PERSONAL PROPERTY - X $1000. ALL OTHER FIGURES ARE PARCEL AVERAGES.

SUMMARY	TAX RATE & SHIFTS	1 FAMILY R1	2 FAMILY R2	3 FAMILY R3	APARTMENTS R4	RES./COMM. RC	COMMERCIAL C	INDUSTRIAL I	AGR./HOR. AH	LAND L	PERSONAL P
# PARCELS	1799153	1068261	146759	62575	39038	17920	64873	12691	3725	383311	0
AV/EV RATIO	48.63	47.11	36.48	35.07	48.13	47.51	54.32	60.62	89.12	41.61	68.12
AV	$37668239	$19580	$13057	$9866	$45072	$30539	$73312	$215031	$15910	$4214	$2751396
EV	$77456625	$41555	$35791	$28127	$93632	$64279	$134961	$354689	$17852	$10128	$4038939
TAXES	$78.58	$1250	$1358	$1366	$4840	$2799	$7578	$19623	$885	$225	$269544
100% TAXES	$36.21	$1429	$1656	$1566	$4437	$2903	$6196	$14106	$502	$333	$155362
TAX CHANGE +	$306602	$180	$306	$231	$83	$391	$11	$12	$0	$111	$45
TAX CHANGE -	$306625-	$1-	$8-	$31-	$486-	$288-	$1394-	$5529-	$382-	$3-	$114226-
NET % CHANGE	10.35	14.32	21.95	14.61	-8.33	3.69	-18.24	-28.11	-43.22	48.05	-42.36
PLAN JA1 INITIAL											
ADJUSTED AV	$77456625	$41555	$35791	$28127	$93632	$64279	$134961	$354689	$17852	$10128	$4038939
NEW TAXES	$38.21	$1429	$1656	$1566	$4437	$2903	$6196	$14106	$502	$333	$155362
TAX CHANGE +	$306602	$180	$306	$231	$83	$391	$11	$12	$0	$111	$45
TAX CHANGE -	$306625-	$1-	$8-	$31-	$486-	$288-	$1394-	$5529-	$382-	$3-	$114226-
NET % CHANGE	10.35	14.32	21.95	14.61	-8.33	3.69	-18.24	-28.11	-43.22	48.05	-42.36
TC (100%) +	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
TC (100%) -	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
NET % CHANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLAN JA1 EQUILIBRIUM											
ADJUSTED AV	$76362169	$40265	$33691	$26584	$95153	$63565	$141816	$385118	$20366	$9452	$4038939
NEW TAXES	$38.79	$1384	$1577	$1527	$4658	$2882	$6756	$15971	$583	$306	$159487
TAX CHANGE +	$229356	$135	$223	$176	$77	$278	$10	$12	$0	$83	$45
TAX CHANGE -	$229385-	$1-	$5-	$16-	$260-	$195-	$833-	$3664-	$301-	$2-	$110101-
NET % CHANGE	7.74	10.72	10.07	11.73	-3.76	2.97	-10.85	-18.60	-34.07	36.00	-40.83
TC (INIT) +	$77978	$0	$3	$15	$234	$93	$561	$1867	$81	$1	$4125
TC (INIT) -	$77985-	$45-	$83-	$55-	$13-	$113-	$1-	$1-	$0	$28-	$0
NET % CHANGE	2.63	-3.14	-4.81	-2.51	4.97	-0.69	9.04	13.22	16.11	-8.14	2.65

Appendix V-A

THE COMMONWEALTH OF MASSACHUSETTS

1978 Acts and Resolves

PAUL GUZZI, Secretary of the Commonwealth

Chap. 580. AN ACT PROVIDING FOR THE TAXATION OF REAL PROPERTY BY USAGE CLASSIFICATION.

Be it enacted, etc., as follows:

SECTION 1. Chapter 58 of the General Laws is hereby amended by striking out section 1, as most recently amended by section 30 of chapter 684 of the acts of 1975, and inserting in place thereof the following section:-

Section 1. The commissioner of corporations and taxation, in chapters fifty-eight to sixty-five C, inclusive, called the commissioner, may visit any town, inspect the work of its assessor and give them such information and require of them such action as will tend to produce uniformity throughout the commonwealth in valuation, classification and assessments. He shall prepare and issue printed instructions to assessors as a guide to them in carrying out said purpose, which shall be adapted to varying local circumstances and to differences in the character and condition of property subject to local taxation. He shall conduct or sponsor inservice or other training programs on the technical, legal and administrative aspects of the classification and assessment processes. For said purpose he may cooperate with other governmental agencies, educational institutions, local, regional, state or national assessors' organizations and any other appropriate professional organization. He may furnish to local assessors blank forms for use in classifying and valuing such property. He may cause an assessor to be prosecuted, either in the county where said officer resides or in an adjoining county, for any violation of law relative to assessment of taxes for which a penalty is imposed.

SECTION 2. The first paragraph of section 3 of said chapter 58, as most recently amended by section 1 of chapter 992 of the acts of 1977, is hereby further amended by striking out the first two sentences and inserting in place thereof the following two sentences:- The commissioner shall annually, on or about January first, furnish to each board of assessors all the information relative to the classification, assessment, valuation and ownership of

property taxable in their town that has come into possession of his department, particularly under chapters sixty-five, sixty-five A and sixty-five C. He shall annually prepare a manual outlining in detail, procedures whereby said assessors may secure uniform classification and assessment of real property and uniform assessment of personal property and just taxation of such property.

SECTION 3. The third paragraph of said section 3 of said chapter 58, added by section 5 of chapter 660 of the acts of 1963, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- The commissioner may require from state and town officers such returns and statements relative to the amount, classification and valuation of taxable property in the several towns as he deems necessary.

SECTION 4. Section 4 of said chapter 58, as appearing in the Tercentenary Edition, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- Whenever it appears to the commissioner that the property or any part thereof in any town is not valued for taxation in accordance with law, and that such failure to comply with the law is the result of inadequate methods in keeping the records of valuation, classification or ownership of property, or is due to failure on the part of its assessors or any of them properly to examine the records of the registry of deeds and probate court, or to make use of the information required to be furnished to assessors by the commissioner, he shall forthwith direct said assessors to adopt such methods of keeping their record or to make such examination of the records of the registry of deeds and probate court, or to make such use of the information that he has furnished to them, as he deems necessary.

SECTION 5. Section 6 of said chapter 58, as so appearing, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- The commissioner may collect and tabulate information as to the classification, sale price and actual cash value of real property in the several towns.

SECTION 6. Section 7C of said chapter 58, as appearing in chapter 649 of the acts of 1955, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- Assessment systems installed in accordance with this chapter shall be such as will, in the

judgement of the commission, be most effective in providing adequate maps for assessment purposes, in maintaining detailed and accurate records of each parcel of property assessed and, generally, in producing uniform and equitable valuations, classifications, and assessments throughout the city or town in accordance with law.

SECTION 7. Section 10 of said chapter 58, as most recently amended by section 6 of chapter 660 of the acts of 1963, is hereby further amended by striking out the first sentence and inserting in place thereof the following sentence:- In determining the equalized valuations required by section nine, the commission may require from state, city and town officers such returns and statements relative to the amount, valuation, and classification of taxable property in the several cities and towns as it deems necessary.

SECTION 8. Section 17B of said chapter 58, as most recently amended by section 1 of chapter 468 of the acts of 1961, is hereby further amended by striking out the second sentence and inserting in place thereof the following sentence:- Such losses of taxes as determined by the commission shall be based on the then current tax rate in each town in which property has been taken for flood control reservoirs and on the average assessed taxable valuation for a period of five years prior to the acquisition of said land; provided, that whenever a town where in a flood control reservoir or portion thereof is located shall have made a general revaluation of property subject to the annual municipal taxes for such town, the commission may use such revaluation for determining the taxes for which payment shall be made.

SECTION 9. The second paragraph of section 1 of chapter 58A of the General Laws, as most recently amended by section 48 of chapter 422 of the acts of 1974, is hereby further amended by striking out the third sentence and inserting in place thereof the following sentence:- The majority of the members of the board shall constitute a quorum for the transaction of its business, except that the board may provide by rule for the decision by a single member on appeals from a board of assessors where the assessed fair cash valuation of the property involved in the appeal does not exceed twenty-five thousand dollars and also in cases where the assessed fair cash valuation exceeds twenty-five thousand but does not exceed fifty thousand dollars when the appellant gives written consent to a decision by a single member.

SECTION 10. The first sentence of section 6 of said chapter 58A, as most recently amended by section 2 of chapter 415 of the acts of 1976, is hereby further amended by inserting after the word "fifty-nine", in line 6, the words:- ; chapter fifty-nine A.

SECTION 11. Section 7 of said chapter 58A, as most recently amended by section 2 of chapter 684 of the acts of 1972, is hereby further amended by striking out the sixth, seventh, eighth, and ninth sentences and inserting in place thereof the following four sentences:- Within such time as the board by its rules may prescribe, the appellee shall file with the board an answer stating fully each finding of fact and ruling of law made with respect to the tax or determination in issue and denying or admitting each and every allegation of fact contained in the petition; except that, in an appeal under section sixty-four or sixty-five of chapter fifty-nine, if the appellee desires to raise no issue other than the question whether there has been an overvaluation or improper classification of the property on which the tax appealed from was assessed, no answer need be filed. If no answer is filed in such a case, the allegation of overvaluation or improper classification of such property shall be held to be denied and all other material facts alleged in the petition admitted. If an answer is filed a copy shall be served upon the appellant, in the manner provided in section nine. The party taking the appeal shall at the time of filing the petition pay to the clerk an entry fee of thirty dollars for each appeal from a decision of the commission, or, in the case of an appeal from a decision of a board of assessors, an entry fee of ten dollars where the assessed fair cash valuation of the real property or personal property, or both, the tax on which is sought to be abated, is fifty thousand dollars or less; or, where such assessed fair cash valuation is in excess of fifty thousand dollars, an entry fee equal to thirty cents on each one thousand dollars of said assessed fair cash valuation.

SECTION 12. Section 7A of said chapter 58A, as most recently amended by section 3 of said chapter 684, is hereby further amended by striking out the third, fourth, fifth, sixth and seventh sentences and inserting in place thereof the following five sentences:- An appellant desiring to be heard under the informal procedure shall pay to the clerk the entry fee provided in section seven, except that the minimum entry fee shall be two dollars if the assessed fair cash valuation of the property on which the tax appealed from

was assessed does not exceed twenty thousand dollars and such property is occupied in whole or in part by the appellant as his dwelling, contains no more than three units designed for dwelling purposes and is in no part used for any other purposes, or if the assessed valuation of the property on which the tax appealed from was assessed does not exceed five thousand dollars and such property is within the class of tangible personal property described in clause twentieth of section five of chapter fifty-nine, and shall file a written waiver of the right to appeal to the supreme judicial court, except upon questions of law raised by the pleadings or by an agreed statement of facts or shown by the report of the board, an election of the informal procedure and a written statement of the facts in the case and of the amount claimed in abatement together with such additional information as the clerk may require. The statement last referred to may be made on forms to be supplied by the board and, if the appellant so requests and the assessed fair cash valuation of the property concerned does not exceed twenty thousand dollars, shall be made out for the appellant by the clerk or an employee of the board designated by the board. The clerk shall then serve a copy of such statement upon the appellee. No further pleadings shall be required under this procedure if the appellee intends to offer no other defense than that the property was not overvalued or that the property was not improperly classified; otherwise it shall file with the board within thirty days of the service of such statement an answer similar to that required under the procedure provided by section seven, hereinafter referred to as the formal procedure. If the assessed fair cash valuation of the property concerned exceeds twenty thousand dollars, the appellee, within ten days of the date of the service of such statement, may elect to have the appeal heard under the formal procedure by so notifying the clerk in writing and by paying him a transfer fee of ten dollars, in which case the said statement shall be considered to be a petition and such service to be service of the petition and the waiver of the right of appeal by the appellant shall be void.

SECTION 13. Section 12A of said chapter 58A, inserted by chapter 430 of the acts of 1943, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- If, at a hearing of an appeal relative to the assessed fair cash valuation of property brought within three years after a determination by the appellate tax board of the valuation

thereof, it appears that the assessed fair cash valuation is greater than the valuation as so determined, the burden shall be upon the appellee to satisfy the board that the increased valuation was warranted and upon failure so to do the board may, in its discretion, tax as costs against the appellee, in addition to witness fees and expenses of service of process, the whole or any part of the reasonable expense of the taxpayer incurred in the preparation, entry and trial of his appeal.

SECTION 14. Section 12B of said chapter 58A, inserted by chapter 262 of the acts of 1950, is hereby amended by striking out the first sentence and inserting in place thereof the following sentence:- At any hearing relative to the assessed fair cash valuation or classification of property, evidence as to the fair cash valuation or classification of property at which assessors have assessed other property of a comparable nature or class shall be admissible.

SECTION 15. Section 13 of said chapter 58A is hereby amended by striking out the first sentence, as appearing in section 4 of chapter 1114 of the acts of 1973, and inserting in place thereof the following sentence:- The board shall make a decision in each case heard by it and make findings of fact and report thereon in writing; provided, that every decision granting an abatement without findings of fact and report which relates to a tax on land with one or more buildings thereon shall, if so requested by the appellee in writing at the commencement of the hearing, state separately the fair cash valuation of the land and of each building.

SECTION 16. Sections three and three A of chapter fifty-nine of the General Laws are hereby repealed.

SECTION 17. The first sentence of clause Seventeenth of section 5 of said chapter 59, as most recently amended by section 1 of chapter 696 of the acts of 1973, is hereby further amended by striking out, in line 1, the word "value" and inserting in place thereof the words:- taxable valuation.

SECTION 18. The last sentence of said clause Seventeenth of said section 5 of said chapter 59, as appearing in section 1 of chapter 1110 of the acts of 1971, is hereby amended by striking out, in line 2, the word "value" and inserting in place thereof the words:- taxable valuation.

SECTION 19. The first paragraph of clause Twenty-second of said section 5 of said chapter 59, as most recently amended by section 2 of said

chapter 1110, is hereby further amended by inserting after the word "dollars", in line 13, the word:- of assessed taxable valuation.

SECTION 20. Paragraph (e) of said clause Twenty-second of said section 5 of said chapter 59, as amended by section 3 of said chapter 1110, is hereby further amended by inserting after the word "dollars", in line 2, the words:- of the taxable valuation of real property.

SECTION 21. Clause Twenty-second A of said section 5 of said chapter 59, as most recently amended by section 5 of said chapter 1110, is hereby further amended by inserting after the word "dollars", in line 19, the words:- of the taxable valuation of real property.

SECTION 22. Clause Twenty-second B of said section 5 of said chapter 59, as most recently amended by section 6 of said chapter 1110, is hereby further amended by inserting after the word "dollars", in line 16, the words:- of the taxable valuation of real property.

SECTION 23. Clause Twenty-second C of said section 5 of said chapter 59, as most recently amended by section 7 of said chapter 1110, is hereby further amended by inserting after the word "dollars", in line 14, the words:- of the taxable valuation of real property.

SECTION 24. Clause Twenty-second D of said section 5 of said chapter 59, as most recently amended by section 8 of said chapter 1110, is hereby further amended by inserting after the word "dollars", in line 1, the words:- of the taxable valuation of real property.

SECTION 25. Clause Twenty-second E of said section 5 of said chapter 59, inserted by section 3 of chapter 831 of the acts of 1974, is hereby amended by inserting after the word "dollars", the first time it appears, in line 11, the words:- of the taxable valuation of real property.

SECTION 26. Clause Thirty-seventh of said section 5 of said chapter 59, as most recently amended by section 1 of chapter 179 of the acts of 1970, is hereby further amended by inserting after the word "dollars", in line 1, the words:- of the taxable valuation of real property.

SECTION 27. Clause Forty-first of said section 5 of said chapter 59 is hereby amended by striking out, in line 2, as appearing in section 1 of chapter 456 of the acts of 1970, the word "valuation" and inserting in place thereof the words:- of the taxable valuation of real property.

SECTION 28. Clause Forty-second of said section 5 of said chapter 59, as most recently amended by section 9 of chapter 1110 of the acts of 1971, is hereby further amended by inserting after the word "dollars", in line 3, the words:- of the taxable valuation of real property.

SECTION 29. Clause Forty-third of said section 5 of said chapter 59, as most recently amended by section 10 of said chapter 1110, is hereby further amended by inserting after the word "dollars", the first time it appears, in line 4, the words:- of the taxable valuation of real property.

SECTION 30. Section six to seven A, inclusive, sections thirteen to seventeen A, inclusive, and sections thirty-eight B and thirty-eight C of said chapter fifty-nine are hereby repealed.

SECTION 31. Said chapter 59 is hereby further amended by striking out section 44, as most recently amended by section 1 of chapter 671 of the acts of 1973, and inserting in place thereof the following section:-

Section 44. This list shall exhibit the valuation, classification and assessment of the real property assessed; and shall contain the names of the owners of the real property assessed, or such description of them as can be given, their places of abode, if known, and a description of the property.

SECTION 32. Section 46 of said chapter 59 is hereby amended by inserting after the word "valuation", in line 2, as appearing in the Tercentenary Edition, the word:- classification.

SECTION 33. The first sentence of section 59 of said chapter 59, as most recently amended by chapter 125 of the acts of 1963, is hereby further amended by inserting after the word "proportion", in line 10, the words:- or upon an improper classification.

SECTION 34. The first sentence of section 64 of said chapter 59, as amended by section 1 of chapter 677 of the acts of 1975, is hereby further amended by striking out, in lines 22 and 23, the words "valuation equal to the average of the valuations" and inserting in place thereof the words:- taxable valuation equal to the average of the taxable valuations.

SECTION 35. Said chapter 59 is hereby further amended by striking out section 76, as appearing in the Tercentenary Edition, and inserting in place thereof the following section:-

Section 76. If the commissioner deems any property subject to taxation not properly valued or classified, he may recommend to the assessors a

revision of its valuation or classification, and they may make an assessment upon any additional value in the manner and within the time provided by the preceding section and subject to its provisions.

SECTION 36. Sections seventy-nine and eighty of said chapter fifty-nine are hereby repealed.

SECTION 37. Said chapter 59 is hereby further amended by striking out section 90, as appearing in the Tercentenary Edition, and inserting in place thereof the following section:-

Section 90. Whoever willfully conceals, removes, transfers, or misrepresents any property to evade proper valuation, assessment or classification, or takes such other action with the intent so as to avoid taxation, shall be punished by a fine of not less than one thousand nor more than five thousand dollars; and he may be indicted either in the county where any of the acts or things made criminal by this section are done or in the county where he is liable to taxation.

SECTION 38. The General Laws are hereby amended by inserting after chapter 59 the following chapter:-

CHAPTER 59A.

CLASSIFICATION OF REAL PROPERTY.

Section 1. The following words shall have the following meanings for purposes of this chapter, unless the context clearly indicates otherwise:-

"Commercial property", all real property and improvements which are not used nor held for use for a residential or industrial and manufacturing purpose, including but not limited to any commercial, business, retail, trade, professional service, recreational, artistic, sporting, fraternal, governmental, educational, medical or religious enterprise. Such property may be used for profit or nonprofit purposes and may be expressly exempt from taxation by other provisions of this chapter or of chapter fifty-nine.

"Commissioner", the commissioner of corporations and taxation.

"Industrial and manufacturing property", all real property and improvements which is used or held for use for profit making purposes involving the manufacturing, milling, producing, processing, or fabricating of materials; the extraction or processing of materials which are unserviceable in their natural state to create commercial products or materials; or the mechanical or chemical transformation of materials or substances into new

products. Industrial and manufacturing property shall include the storage, transmitting and generating facilities of utilities regulated by the department of public utilities.

"Open space property", all real property and improvements thereto which is used for profit or nonprofit purposes, and which is characterized principally by an open or natural condition and whose preservation provides the public with the benefit of the conservation of natural resources such as air, water and wildlife, or whose preservation contributes to the enjoyment and economic value of surrounding residential, commercial or industrial and manufacturing property. No private association or club shall be deemed owner of "open space property" that discriminates its membership on grounds of race religion or sex. Such associations shall be deemed owners of "commercial property".

"Parcel", a unit of real property as defined by the assessor in accordance with the deed for such property.

"Residential property", all real property and improvements thereto which is used or held for use for human habitation and which contains a room or group of rooms which form a habitable unit for a person or persons and which has facilities used or intended to be used for living, sleeping, cooking and eating. Residential property includes accessory buildings and property determined by the assessors to be incidental to property used for human habitation if such accessory property is available for use only by the resident, or residents. Residential property shall not include a hotel, motel or lodging house.

Section 2. All real property within the commonwealth shall be subject to valuation and classification by the assessors of the city or town in which the real property is situated. Real property for the purposes of valuation, classification and taxation shall include all land and all buildings and improvements thereon or affixed thereto.

Section 3. The assessors of each city and town shall determine the fair cash valuation and classification of real property for the purposes of taxation according to the valuation and the use of such property on the first day of January of each year.

Section 4. The assessors shall determine the fair cash valuation of all real property according to section thirty-eight of chapter fifty-nine and

shall secure an equitable and uniform valuation of all real property situated in the same class.

Section 5. The assessors shall classify all taxable real property according to the following uses:

Class one.

All real property and the improvements thereto, if any, used or held for use for residential purposes, shall be classified as class one property.

Class two.

All real property and the improvements thereto, if any, used or held for use for commercial purposes, shall be classified as class two property.

Class three.

All real property and the improvements thereto, if any, used or held for use for industrial or manufacturing purposes, shall be classified as class three property.

Class four.

Upon approval by the assessors of an application filed in accordance with section six, all real property and the improvements thereto, if any, which is open space property shall be classified as class four property.

Section 6. The eligibility of real property for classifications as class four, open space property, shall be determined for each tax year. Application therefor shall be submitted to the assessors of each city and town in which such land is situated not later than October first of the year preceding the tax year for which such classification is being sought. Application shall be made on a form prescribed by the commissioner and provided for the use of the applicant by said assessors. Such form shall provide for the reporting of such information as the assessor may require to aid him in determining whether such land qualifies for class four classification, and shall provide a statement of the potential tax liability under sections thirty-seven and thirty-eight. The applicant shall sign and certify the accuracy of such application under the penalties of perjury.

Failure to file an application for the classification of property as class four property within the time and in the manner prescribed shall constitute a waiver of the right to such classification.

Section 7. An application for classification of property as class four property shall be allowed or disallowed by the assessors of the city or town

in which such land is located within three months of the filing thereof. An application for classification as class four property shall be disallowed by the assessors of the city or town in which such land is located if, in their judgment, such land does not qualify thereunder. The failure of the assessors to allow or disallow any such application within three months following the filing thereof, shall be deemed to be an allowance of such application. The assessors shall within ten days of an allowance, or disallowance, send written notice of such allowance or disallowance by certified mail to the applicant and shall set forth therein the reason or reasons for disallowance together with a statement advising the landowner of his right to appeal therefrom as provided in section fifty-nine of chapter fifty-nine.

With respect to the first application relating to a parcel of land which has been approved, and any subsequent such application after a lapse of time when such land has not been classified as class four property, or after a change of record ownership of such land, the assessors shall forthwith cause to be recorded in the registry of deeds of the county or district in which the city or town is situated a statement of their action which shall constitute a lien upon the land covered by such application for such taxes as may be levied under the provisions of this chapter. The statement shall name the owner or owners of record and shall include a description of the land adequate for identification. Unless such a statement is recorded the lien shall not be effective with respect to a bona fide purchaser or other transferee without actual knowledge of such lien. Upon application by any record owner, such liens shall be released by the assessors with respect to any parcel of land as provided below in this section upon the applicable facts being established by their records or by affidavits or otherwise.

All liens for a conveyance tax under section thirty-seven shall be released upon its being so established that no conveyance or change of use by the owner at the time of such release will result in a conveyance tax under said section or that any such taxes which have become due have been paid.

All liens for roll-back taxes under section thirty-eight, other than roll-back taxes based on a change of use after the date of such release, shall be released upon its being established that no roll-back taxes have become due or that any such taxes which have become due have been paid.

The assessors shall also have the power and authority to release any such liens to correct any errors or omissions. Any release under this section shall be recorded with the registry of deeds.

When any land which has been classified as class four property ceases to be so classified the assessors shall forthwith record in the registry of deeds a statement to that effect which shall include the name of the record owner or owners, the date when such land ceased to be so valued, assessed and taxed and a description of the land adequate for identification.

Section 8. All real property which is exempt from taxation under section five of chapter fifty-nine shall be classified according to guidelines promulgated by the commissioner.

Section 9. Where real property is used for more than one purpose and such use would result in different classifications, then the assessors shall classify such property by determining the percentage of the fair cash valuation of the property which is allocated to each use.

Section 10. All real property situated within the commonwealth shall be subject to taxation, unless such property is expressly exempt, in whole or in part, under this chapter or under section five of chapter fifty-nine.

Section 11. Mortgages upon taxable buildings or other improvements shall be deemed mortgages of real property for the purposes of taxation, and shall be taxed under this chapter.

Section 12. The assessors before making an assessment shall give reasonable notice thereof to all persons subject to taxation of real property in their respective city or town. Such notice shall be posted in one or more public places in each city or town, or shall be given in some other sufficient manner, and shall require said persons to bring to the assessors such lists as may be required under section twenty-nine of chapter fifty-nine. The assessors shall administer such lists in the manner, and under the conditions, specified in sections thirty through thirty-seven, inclusive, of chapter fifty-nine.

Section 13. A board of assessors may request the owner or lessee of any real property to make a written return under oath within sixty days containing such information as may reasonably be required by it to determine the actual fair cash valuation of such property.

Failure of an owner or lessee of real property to comply with such request within sixty days after it has been made shall bar him from any statutory appeal under this chapter, unless the owner or lessee of such real property was unable to comply with such request for reasons beyond his control. If any owner or lessee of real property in a return made under this section makes any statement which he knows to be false in a material particular, such false statement shall bar him from any statutory appeal under this chapter.

Section 14. A board of assessors may require testimony under oath of a taxpayer relative to his written return filed under section thirteen and may also require testimony under oath of any applicant for abatement under section thirty-six.

Section 15. The assessors shall make, on the books furnished under section forty-five of chapter fifty-nine, a list of the valuation, classification and assessment of all real property in their respective city or town. The assessors shall administer such lists in the manner, and under the conditions, specified in sections forty-three, forty-four, forty-six, forty-nine, fifty, fifty-one and fifty-two of chapter fifty-nine.

Section 16. If real property which is liable to taxation is omitted from the annual assessment of taxes or if the taxation of such property is invalid by reason of error or irregularity in the assessment, the assessors may reassess such property or reassess such tax in the manner and under the conditions specified in sections seventy-five through seventy-eight, inclusive, of chapter fifty-nine.

Section 17. There shall be exempt from property taxation, except special assessments, five thousand dollars of the taxable valuation of residential real property. No more than one residential real property exemption shall be allowed to any one residential parcel. This exemption shall be in addition to all exemptions which may be granted under section five of chapter fifty-nine; provided, however, in no instance shall the taxable valuation of such property be reduced below ten per cent of the fair cash valuation of such property, unless such reduction has been caused by the application of clause eighteen of section five of chapter fifty-nine.

Section 18. In determining the taxation of nonexempt real property classified under section five, the assessor shall apply to the fair cash valuation of such property the following percentages:

Class one, forty per cent;

Class two, fifty per cent;

Class three, fifty-five per cent;

Class four, twenty-five per cent.

Section 19. All real property, which is not totally exempt from taxation, shall be taxed according to the following procedures:

First, the assessor shall determine the fair cash valuation of the property.

Second, the assessor shall determine the classification of the property.

Third, the assessor shall apply the classification ratio to the fair cash valuation of the property. The resulting figure shall determine the taxable valuation for all real property within classes two, three and four.

Fourth, the assessor shall apply the residential exemption to all property in class one. The resulting figure shall determine the taxable valuation for all real property within class one.

Fifth, the assessor shall apply the tax rate, as determined by the city or town, to the taxable valuation to reach the tax which shall be due and payable on such property.

Section 19A. All real and personal property of electric and gas utility companies subject to rate regulation by the department of public utilities or the federal energy regulatory commission, unless such property is otherwise exempted by law, shall be exempt from real and personal property tax under this chapter and under chapter fifty-nine; provided, however, that such utility companies shall be subject to a local excise for the privilege of doing business in a city or town. To compute such excise, the assessor of each city and town in which such utility company property exists shall multiply the current tax rate by the current assessed value of such property, as determined by the state tax commissioner. The current assessed value of such property of such electric and gas utility companies in each city or town shall be determined by multiplying the current net book value of such property by the assessment factor computed by use of the following formula:-

$$F \text{ EQUALS } \frac{AVU}{CVU} \text{ TIMES } \frac{CVN}{AVN}$$

As used in the foregoing formula the following letters shall have the following meanings:-

F, excise assessment factor

AVU, actual assessed value for fiscal year nineteen hundred and

seventy-eight, as finally determined under the appeal procedures of chapter fifty-nine, of all real and personal property of utility companies within the city or town.

CVU, net book value for fiscal year nineteen hundred and seventy-eight of all real and personal property of utility companies within the city or town, as determined by the state tax commissioner.

CVN, taxable valuation for fiscal year nineteen hundred and seventy-eight of all real and personal property of non-utilities within the city or town, determined as though chapter fifty-nine A had been applicable thereto.

AVN, actual assessed valuation for fiscal year nineteen hundred and seventy-eight of all real and personal property of non-utilities within the city or town.

Excises so assessed by such city or town for such privilege of doing business shall be paid in accordance with the applicable provisions of chapter fifty-nine and this chapter.

The state tax commissioner may require a utility company subject to such local excise to provide information necessary to establish the net book value of real and personal property in each city and town where such property is located.

Section 20. Except as otherwise provided in section twenty-two, real estate owned in fee or otherwise or held in trust for the benefit of the United States, the commonwealth, or a county, city or town, or any instrumentality thereof, if used in connection with a business conducted for profit or leased or occupied for other than public purposes, shall for the privilege of such use, lease or occupancy, be valued, classified, and taxed annually as of January first to the user, lessee or occupant in the same manner and to the same extent as if such user, lessee or occupant were the owner thereof in fee, whether or not there is any agreement by such user, lessee or occupant to pay taxes assessed under this section; provided, however, that whenever under the constitution and laws of the United States the privilege of such use, lease or occupancy of real estate owned by the United States cannot be taxed as aforesaid, but a leasehold or other interest in such real estate or the ownership of or an interest in buildings and other things erected thereon or affixed thereto, may be taxed, such interest or ownership shall be valued, classified, assessed and taxed to the holder thereof to the extent permitted by such constitution and laws. Except as

otherwise provided, a payment purporting to be in lieu of a local tax for a particular year on real estate subject to this section shall be applied in reduction of the tax assessed under this section for such year with respect to such real estate. Notwithstanding any contrary provision of section thirty, unless there is a different agreement, no tax assessed under this section shall be retained out of rent or recovered under section thirty.

No tax assessed under this section shall be a lien upon the real estate with respect to which it is assessed; nor shall any such tax be enforced by any sale or taking of such real estate; but the interest of any lessee therein may be sold or taken by the collector of the town in which the real estate lies for the nonpayment of such tax in the manner provided by law for the sale or taking of real estate for nonpayment of annual taxes. Such collector shall have for the collection of taxes assessed under this section all other remedies provided by chapter sixty for the collection of annual taxes upon real estate.

This section shall not apply to a use, lease or occupancy which is reasonably necessary to the public purpose of a public airport, port facility, highway, turnpike, transportation system, park, or similar property which is available to the use of the general public or to easements, grants, licenses or rights of way of public utility companies; to the property of the United States, or any instrumentality thereof, for which payments are made in lieu of taxes in amount equivalent to taxes which might otherwise be lawfully assessed, in behalf of the United States or any instrumentality thereof; or to the property of the United States, or any instrumentality thereof, which is used by the manufacturing corporation so classified under chapter fifty-eight.

Section 21. All interests in real property situated within the commonwealth heretofore or hereafter acquired by any corporation by eminent domain and all such interests in real property heretofore or hereafter purchased by any corporation when it could have been acquired by eminent domain shall, unless expressly exempt by the charter of such corporation or by statute, be taxed to such corporation. This section shall not apply to real property of the commonwealth or of any of its political subdivisions; nor shall it apply to real property of a railroad corporation, which shall continue to be governed by section eighty-seven of chapter one hundred and sixty and any other provisions of law applicable thereto.

Section 22. Whenever the Congress of the United States has so provided a leasehold interest in real property owned and leased by the United States and in buildings and other things erected thereon or affixed thereto shall be assessed and taxed to the lessee or his assigns to the extent so provided by the Congress. Payment of the aforesaid taxes shall not be enforced by any lien upon or sale of the said real property, but, in the case of any leasehold subject to taxation as aforesaid, the interest of the lessee or lessees or their assigns therein may be sold by the collector of taxes of the city or town in which the real property is situated for the nonpayment of the tax assessed as aforesaid in the manner provided by law for the sale of real property for nonpayment of local taxes. Said collectors shall have for the collection of taxes assessed under this section all other remedies provided by chapter sixty for the collection of taxes by collectors of cities and towns.

Section 23. Property held by a city, town or district including the metropolitan water district, in another city or town for the purpose of a water supply, the protection of its sources or of sewage disposal, or of a public airport if yielding no rent, shall not be liable to taxation therein; but the city, town or district so holding it shall, annually on July first, pay to the city or town where it lies an amount equal to that which such city or town would receive for taxes upon the average of the assessed taxable vaulation of the land, which shall not include buildings or other structures except in the case of land taken for the purpose of protecting the sources of an existing water supply, for the three years last preceding the acquisition thereof, the valuation for each year being reduced by all abatements thereon. Whenever a city or town in which such land is located shall have made a general revaluation of all its real property for purposes of taxation, the valuation of such land for the purpose of payments authorized by this section shall be determined by the state tax commission as of January first, between January first and June first, in the year nineteen hundred and seventy and in every fifth year thereafter, so that the payment with respect to such land shall remain substantially the same as that made prior to such revaluation. The city, town or district owning such land, if aggrieved by the determination of the commission, may within three months after written notice thereof appeal to the appellate tax board. Any part of such land or buildings from which any revenue in the nature of rent is received shall be subject to taxation. Revenue received for the use of such areas of land within the property so held for the purpose of a public airport as are used for the take-off and landing

of aircraft, including runways and taxi strips, or the use of buildings on such property which are used as a terminal or administration building or for housing, servicing and repairing aircraft, shall not be deemed to be rent or revenue in the nature of rent within the meaning of this paragraph.

If such land is part of a larger tract which has been assessed as a whole, its assessed taxable valuation in any year shall be taken to be that proportional part of the taxable valuation of the whole tract which the value of the land so acquired, exclusive of buildings, bore in that year to the value of the entire estate.

Section 24. The assessors of a city or town where land is acquired by such other city, town or district for water supply or sewage disposal or for a public airport shall, within one year after such acquisition, determine the average taxable valuation of such land under the preceding section and certify the amount so determined to such other city, town or district. The mayor or selectmen, the commissioners or prudential committee of a district, or the metropolitan district commission, within six months after receipt of said certificate, may appeal from such determination to the appellate tax board; and said board shall determine the valuation in the manner provided in the preceding section, and section sixty-five of chapter fifty-nine so far as applicable, shall govern such appeal.

If land within any city or town shall have been taken from it for said purposes, and for any one of the three years prior to the taking no taxes have been collected thereon, the city or town and the board or officer having charge of the land so taken may within six years after the taking agree as to the valuation of the land upon which the annual payment is to be made as aforesaid from the time of the taking, and if they cannot agree the board or officer shall notify the city or town thereof, and thereupon the value shall be determined by the appellate tax board under said section sixty-five of chapter fifty-nine and said notice shall be deemed to be the notice referred to in said section sixty-five of chapter fifty-nine. This and section twenty-three shall apply to property held for the purposes of the metropolitan water supply, except property situated in Ashland, Boylston, Holden, Hopkinton, Sterling or West Boylston, but shall apply only to property acquired by a city, town or district, including the metropolitan water district, prior to January first, nineteen hundred and forty-six.

Section 25. Land acquired on or after January first, nineteen hundred and forty-six, by a municipality or a district, including the metropolitan water district, and held on January first in any year for any public purpose by such municipality, in this section referred to as the holding municipality, or by such district, if such land lies in a municipality other than such holding municipality, or, in the case of land so acquired and held by a district, in a municipality other than the municipality or municipalities in which the district lies or which constitute the district, shall, with all buildings and other things erected thereon or affixed thereto, be exempt from taxation in such year except as hereinafter otherwise provided; but such holding municipality or district shall, on July first of such year, pay to the municipality where such land lies the amount which would be assessable for the next following year upon a valuation equal to the average of the assessed taxable valuations of the land and all buildings and other things erected thereon or affixed thereto on the three assessment dates next preceding the acquisition of the land, the assessed taxable valuation for each assessment date being reduced by all abatements, if any. If land subject to this section was not separately assessed or was exempt from taxation on any of said assessment dates, the assessors shall determine an assessed taxable valuation for the land and all buildings and improvements thereto according to guidelines promulgated by the commissioner. Whenever a city or town in which such land is located shall have made a general revaluation of all its real property for purposes of taxation, the valuation of such land for the purpose of payments authorized by this section shall be determined by the state tax commission as of January first, between January first and June first, in the year nineteen hundred and seventy and in every fifth year thereafter, so that payment with respect to such land shall remain substantially the same as that made prior to such revaluation. The holding municipality or district, if aggrieved by the determination of the commission, may within three months after written notice thereof appeal to the appellate tax board.

The assessors of the municipality where land subject to this section lies shall determine the average taxable valuation in accordance with this section and certify such valuation to the holding municipality or district liable under this section. Such holding municipality or district, if aggrieved by such determination, may within three months, after such certification appeal to the appellate tax board, which shall determine the average taxable valuation in accordance with this section.

If rent or any revenue in the nature of rent is received from any part of any real estate subject to this section, the party yielding such rent or revenue shall be subject to taxation. The tax shall be in addition to the amount payable under this section. Revenue received for the use of such portions of a public airport as are used for the taking off and landing of airplanes, including runways, taxi and transition strips, or revenue received for the use of buildings on a public airport, which are actually and exclusively used for servicing and repairing airplanes, shall not be deemed to be rent or revenue in the nature of rent within the meaning of this paragraph.

Section 26. Taxes on real estate shall be assessed in the town where it lies, to the person who is the owner on January first, and the person appearing of record, in the records of the county, or of the district, if such county is divided into districts, where the estate lies, as owner on January first, even though deceased, shall be held to be the true owner thereof; provided, that whenever the commissioner deems it proper he may, in writing, authorize the assessment of taxes upon real estate to the person who is in possession thereof on January first, and such person shall thereupon be held to be the true owner thereof for the purposes of this section; and provided, further, that whenever the commissioner deems it proper he may, in writing, authorize the assessment of taxes upon any present interest in real estate to the owner of such interest on January first, and taxes on such interest may thereupon be assessed to such person. Real estate held by a religious society as a ministerial fund shall be assessed to its treasurer in the town where the land lies. Buildings erected on land leased by the commonwealth under section twenty-six of chapter seventy-five shall be assessed to the lessees, or their assignees, at the taxable valuation of said buildings. Except as provided in the three following sections, mortgagors or real estate shall for the purpose of taxation be deemed the owners until the mortgagee takes possession, after which the mortgagee shall be deemed the owner.

Whenever the assessors of any town assess a tax on real estate to a person other than the person appearing of record, in the records of the county, or of the district, if such county is divided into districts, where the estate lies, as owner on January first, such assessors shall, if the tax is a lien upon such real estate under section thirty-seven of chapter sixty, unless the commissioner shall certify that the assessors by reasonable diligence cannot ascertain the name of the person so appearing of record, include in such assessment the name of the person so appearing of record without imposing upon him personal liability for the tax.

Whenever the commissioner deems it proper he may, in writing, authorize the assessment of taxes upon real property to persons unknown, provided that the assessors certify to the commissioner that they cannot by reasonable diligence ascertain the name of the person appearing of record.

Real estate permanently restricted under section seventeen B of chapter twenty-one, section one hundred and five of chapter one hundred and thirty, section forty A of chapter one hundred and thirty-one and section thirty-one of chapter one hundred and eighty-four shall be assessed as a separate parcel of real estate. The initial assessment as a separate parcel shall be made on January first of the year next following the conveyance of such permanent restriction.

Section 27. If any person has an interest in real estate, not exempt from taxation under section five of chapter fifty-nine, as holder of a duly recorded mortgage given to secure the payment of a fixed and certain sum of money, the amount of his interest as mortgagee shall be assessed as real estate in the town where the land lies; and the mortgagor shall be assessed only for the taxable valuation of such real estate after deducting the taxable valuation of the interest therein of such mortgagee. If such real estate is situated in two or more towns, the amount of the mortgagee's interest to be assessed in each town shall be proportioned to the taxable valuation of the mortgaged real estate in the respective towns, deducting therefrom the taxable amount of prior mortgages, if any, thereon.

Section 28. If the holder of such mortgage fails to file in the assessor's office a sworn statement of all his estate liable to taxation under the preceding section, including a statement of the full amount remaining unpaid upon such mortgage and of his interest therein, the amount stated in the mortgage shall be conclusive as to the extent of such interest; but his interest in such real estate shall not be assessed at a greater sum than the taxable valuation of the land and the structures thereon or affixed thereto; and the amount of a mortgage interest in an estate divided after the creation of such mortgage need not be apportioned upon the several parts of such estate, except as provided in sections twenty-nine to thirty-five, inclusive. Whenever, in any case of mortgaged real estate, such statement is not brought in, no tax on such real estate for the year then current shall be invalidated for the reason that a mortgagee's interest therein has not been assessed to him.

Section 29. Mortgagors and mortgagees referred to in the two preceding sections shall for the purpose of taxation be deemed joint owners until the mortgagee takes possession; and until such possession is taken by a first mortgagee, an assessor or the collector of taxes, upon application, shall give to any such mortgagee or mortgagor a tax bill showing the whole tax on the mortgaged estate and the amount included in the valuation thereof as the interest of each mortgagee and of the mortgagor respectively. If the first mortgagee is in possession, he shall be deemed sole owner; and any other mortgagee in possession shall be deemed joint owner with prior mortgagees.

Section 30. If a tenant paying rent for real estate is taxed therefor, he may retain out of his rent the taxes paid by him, or may recover the same in an action against his landlord, unless there is a different agreement between them.

Section 31. The undivided real estate of a deceased person may be assessed to his heirs or devisees, without designating any of them by name, until the names of such heirs or devisees appear in the probate court records in the county in which said real estate lies; and each heir or devisee shall be liable for the whole of such tax, and when paid by him he may recover of the other heirs or devisees their respective proportions thereof.

Section 32. The real estate of a person deceased, the right or title to which is doubtful or unascertained by reason of litigation concerning the will of the deceased or the validity thereof, may be assessed in general terms to his estate, and said tax shall constitute a lien upon the land so assessed and may be enforced by sale of the same or a part thereof, as provided for enforcing other liens for taxes on real estate.

Section 33. Wherever real estate has been unassessed because the right or title thereto has been doubtful or unascertained because of missing records or otherwise, and a municipality has conducted a search and has determined the record ownership of said real estate, the said real estate shall become subject to a lien for the expenditures incurred by said municipality in the determination of said ownership. The assessors of said municipality shall forthwith cause to be recorded in the registry of deeds for the county or district in which the real estate is located a statement containing the name of the owner or owners of said real estate, an adequate description thereof, and the amount of said expenditures incurred, for which amount a lien on said

real estate shall become effective as of the time and date of its recording. No such lien shall be effective against a bona fide purchaser or other transferee without notice of such lien. The recording fee for such statement shall be added to and become a part of the expenditures constituting said lien.

Section 34. If real property is divided by sale, mortgage, upon a petition for partition or otherwise, after a tax has been assessed thereon and such division has been duly recorded in the registry of deeds, the assessors, at any time before said real property has been advertised for sale for nonpayment of taxes, upon the written request of the owner or mortgagee of an portion thereof, shall apportion the tax, with costs and interest upon the several parcels thereof, in proportion to the value of each, and only the portion of said tax, interest and costs so apportioned upon any such parcel shall continue to be a lien upon it; and the owners or mortgagees shall be liable only for the tax apportioned upon the parcel owned in whole or in part by them respectively. If a tax so apportioned upon any parcel remains unpaid after such a commitment to the collector, it may be recovered in an action of contract or in any other appropriate action, suit or proceeding brought by the collector either in his own name or in the name of the town against said owners and mortgagees.

Section 35. A person aggrieved by any action of the assessors may within seven days thereafter appeal in like manner as in the case of an overassessment, and the decision upon such appeal shall be final.

Section 36. A person upon whom a tax has been assessed under this chapter, if aggrieved by the determination of the assessors as to their fair cash valuation or classification or by a denial or an exemption for such property, shall have the right to file an application for an abatement under section fifty-nine of chapter fifty-nine. If the assessors deny such application for abatement, the taxpayer shall have the right to appeal such denial under sections sixty through seventy-four, inclusive, of chapter fifty-nine.

Section 37. Any real property which is classifed as class four property which is sold for other use within a period of ten years from the earliest date of its uninterrupted class four classification shall be subject to a conveyance tax applicable to the total sales price of such property which tax shall be in addition to such taxes as may be imposed under any provision of law. Said conveyance tax shall be at the following rate: ten per cent if

sold within the first year of ownership; nine per cent if sold within the second year of ownership; eight per cent if sold within the third year of ownership; seven per cent if sold within the fourth year of ownership; six per cent if sold within the fifth year of ownership; five per cent if sold within the sixth year of ownership; four per cent if sold within the seventh year of ownership; three per cent if sold within the eighth year of ownership; two per cent if sold within the ninth year of ownership; one per cent if sold within the tenth year of ownership. No conveyance tax shall be imposed under the provisions of this section following the end of the tenth year of ownership. Said conveyance tax shall be due and payable by the grantor at the time of transfer of the property by deed or other instrument of conveyance and shall be payable to the tax collector of the city or town in which the property is entered upon the tax list; provided, that, in the case of taking by eminent domain, the value of the property taken shall be determined in accordance with the provisions of chapter seventy-nine and the amount of conveyance tax, if any, shall be added thereto as an added value; and provided further, that if there is filed with the assessors an affidavit by the purchaser that such land is being purchased for class four use, no conveyance tax shall be payable by the seller by reason of such sale, but if such property is not in fact continued in such use, the purchaser shall be liable for any conveyance tax that would have been payable on such sale as a sale for other use.

If any tax imposed under this section should not be paid, the collector of taxes shall have the same powers and be subject to the same duties with respect to such taxes as in the case of the annual taxes upon real estate, and the law in regard to the collection of the annual taxes, to the sale of land for the nonpayment thereof, and to redemption therefrom, shall apply to such taxes so far as the same are applicable. Any property which is classified as class four property, if changed by the owner thereof to another use within a period of ten years from the date of its acquisition by said owner, shall be subject to the conveyance tax applicable hereunder at the time of such change in use as if there had been an actual conveyance, and the value of such property for the purpose of determining a total sales price shall be fair cash value as determined by the assessors of the city or town.

Section 38. Whenever property which is classified as class four property no longer qualifies as class four property it shall be subject to additional

taxes, hereinafter referred to as roll-back taxes, in the current tax year in which it is disqualified and in such of the four immediately preceding tax years in which the land was so classified, provided, that such roll-back taxes shall not be applicable unless the amount thereof as computed pursuant to this section, exceeds the amount, if any, imposed under the provisions of section thirty-seven and, in such case, the property shall not be subject to the conveyance tax imposed under said section thirty-seven and, provided further, that no roll-back taxes shall be applicable if the property involved is purchased for a public purpose by the city or town in which it is situated. For each year, the roll-back tax shall be an amount equal to the difference, if any, between the taxes paid or payable in accordance with class four property and that taxes that would have been paid or payable had the property been classified according to the new use.

Section 39. The assessment, collection, apportionment and payment of the roll-back taxes imposed by section thirty-eight shall be governed by the procedures provided for the assessment and taxation of omitted property under section seventy-five of chapter fifty-nine. Such procedures shall apply to each tax year for which roll-back taxes may be imposed notwithstanding the limitation set forth in said chapter fifty-nine with respect to the periods for which omitted property assessments may be imposed.

Section 40. Certificates as to Conveyance or Roll-Back Taxes.

In connection with any proposed or completed sale or other transfer of any real property which has been classified as class four property the owner of record of the land may apply to the board of assessors for a certificate of the amount of conveyance tax and roll-back tax, if any, payable by reason of such sale or other transfer, or that no such tax will or has so become payable and stating the amount of any conveyance or roll-back taxes that have theretofore become payable with respect to such real property and such a certificate shall be provided to the applicant within twenty days after application therefor. Such certification may be recorded with the registry of deeds; and upon recording of such a certificate that no such tax will or has so become payable, or a certificate by the collector of taxes that the amount of tax stated in such certificate of the board of assessors has been paid, all liens on such real property for taxes under this chapter shall terminate, except that any liens for any roll-back taxes assessed by reason of such real property ceasing to qualify for valuation, assessment and taxation under this

chapter after the date of such sale or other transfer, shall continue. In connection with the issuance of such a certificate, the assessors may rely upon their own records, affidavits and other information as they may deem appropriate. The assessors shall charge six dollars for each certificate so issued, and the money so received shall be paid into the town treasury.

Section 41. Whoever willfully conceals, transfers, or misrepresents any real property with the intent to evade proper valuation, classification or assessment of real property shall be penalized under the provisions of sections eighty-nine, ninety, and ninety-one of chapter fifty-nine.

Section 42. Classification of real property shall be implemented on January first, nineteen hundred and seventy-nine; provided however, that no city or town shall classify real property until all real property located within such city or town has been assessed at fair cash valuation as mandated by law and such assessment has been certified by the commissioner.

SECTION 39. Section 3A of chapter 60 of the General Laws, as most recently amended by section 5 of chapter 831 of the acts of 1974, is hereby further amended by striking out the second, third and fourth sentences and inserting in place thereof the following three sentences:-

Every tax bill or notice shall also contain a statement indicating the provisions of law governing interest on the tax to which the bill or notice relates. Every bill or notice for a real property tax shall have printed thereon in a conspicuous place the school rate, the general tax rate and the total tax rate of the town, as determined by the assessors. In addition, every bill or notice for a tax upon real property shall, by street and number, or if no street number has been assigned, by lot number or by name of property or otherwise, describe in a manner sufficient to identify it, each parcel of real property separately assessed and shall state for each such parcel the fair cash valuation of the land, the fair cash valuation of the buildings and other improvements erected thereon and affixed thereto, the classification of the property, the five thousand dollar residential exemption, if any, the taxable valuation of the property and the tax due and payable on such property.

SECTION 40. This act shall take effect upon the ratification at the biennial state election to be held in the year nineteen hundred and seventy-eight of a legislative amendment, entitled "Proposal for a legislative amendment to the Constitution authorizing the classification of property according to its use for the purpose of taxation?" This act shall be

applicable to property taxes assessed for the fiscal year beginning nineteen hundred and eighty. If such amendment is not ratified this act shall be null and void.

SECTION 41. The commissioner of corporations and taxation shall, not later than the first Wednesday of December in the years nineteen hundred and seventy-nine and nineteen hundred and eighty, file a report with the clerks of the house and the senate on the effect of the provisions of this act on the property taxpayers of the commonwealth. Said report shall include but not be limited to an analysis of the property tax bills for each class of property established under the provisions of this act, for the commonwealth as a whole and each city and town thereof. Said analysis shall include but not be limited to a statement, for each of said classes of property, of the average tax bill and the proportion of the total property tax burden each of said classes of property bears to the whole: (1) before one hundred per cent valuation for those cities and towns which were not at one hundred per cent valuation as of January first, nineteen hundred and seventy-five, (2) after one hundred per cent valuation but before implementation of the provisions of this act, and (3) after implementation of the provisions of this act. Said report shall also include but not be limited to an analysis of the implementation of the provisions of this act including without exclusion the names of the cities and towns which have not been certified under the provisions of section fifty-three of this act.

SECTION 42. This act shall terminate June thirtieth, nineteen hundred and eighty-four.

Approved July 24, 1978

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Appendix V-B

Chapter 797

THE COMMONWEALTH OF MASSACHUSETTS

In the Year One Thousand Nine Hundred and Seventy- Nine

AN ACT MAKING CHANGES IN THE LAW PROVIDING FOR THE TAXATION OF REAL PROPERTY BY USAGE CLASSIFICATION.

Whereas, The deferred operation of this act would tend to defeat its purpose which is to provide immediately for the taxation of real property by usage classification and to provide for an equitable application of the real property tax burden among commercial, industrial and residential property owners, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. Chapter 40 of the General Laws is hereby amended by adding the following section:-

Section 56. The board of assessors with the approval of the selectmen in each town and the mayor, with the approval of the city council of each city, which city or town has been certified by the commissioner of revenue to be assessing property at full and fair cash valuation, shall biennially on or before May first determine the percentages of the local tax levy to be borne by each class of real property, as defined in section three of chapter fifty-nine, and personal property for the next two fiscal years. In determining such percentages, the selectmen or mayor, as the case may be, shall first adopt a residential factor. Said factor shall be an amount not less than the minimum residential factor determined by the commissioner of revenue in accordance with the provisions of section one A of chapter fifty-eight.

Class one percentage, the full and fair cash valuation of the class one property divided by the full and fair cash valuation of all real and personal property in said city or town multiplied by the residential factor.

Class two percentage, the full and fair cash valuation of the class two property divided by the full and fair cash valuation of all real and personal property in said city or town multiplied by not less than eighty-five per cent of the residential factor.

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Class three percentage, the full and fair cash valuation of the class three property divided by the sum of full and fair cash valuation of class three and class four real property and personal property in such city or town multiplied by the difference between one hundred per cent and the sum of the class one and two percentages.

Class four percentage, the full and fair cash valuation of the class four property divided by the sum of the full and fair cash valuation of the class three and class four real property and personal property in such city or town multiplied by the difference between one hundred per cent and the sum of the class one and class two percentages.

Personal property percentage, the full and fair cash valuation of the personal property in a city or town divided by the sum of the full and fair cash valuation of the class three and class four real property and the personal property in a city or town multiplied by the difference between one hundred per cent and the sum of the class one and class two percentages.

As used in this section the full and fair cash valuation amounts shall be those amounts as determined by the commissioner of revenue and sent to each city and town pursuant to section one A of chapter fifty-eight.

The percentages, so determined, shall upon certification of the commissioner be transmitted to the board of assessors to be used in setting the tax rates pursuant to section twenty-three A of chapter fifty-nine.

SECTION 2. Chapter 41 of the General Laws is hereby amended by inserting after section 30A the following section:-

Section 30B. Any two or more cities and towns may enter into an agreement for joint or cooperative assessing, classification and valuation of property. Such agreement shall provide for:-

(1) the division, merger or consolidation of administrative functions between or among the parties, or the performances thereof by one city or town on behalf of all the parties;

(2) the financing of the joint or cooperative undertaking;

(3) the rights and responsibilities of the parties with respect to the direction and supervision of the work to be performed and with respect to the administration of the assessing office including the receipt and disbursement of funds, the maintenance of accounts and records and the auditing of accounts;

(4) annual reports of the assessor to the constituent parties;

(5) the duration of the agreement and procedures for amendment or termination thereof; and

(6) any other necessary or appropriate matter.

Unless the agreement provides for assessing by one city or town on behalf of the other cities and towns parties thereto, the agreement shall provide for the designation of an appointing authority representing all of the cities and towns in the district, which shall be responsible for the appointment of an assessor who shall serve as the assessor for each and all cities and towns in the district. Subject to the rules and regulations established by the commissioner of revenue pursuant to section one of chapter fifty-eight, the agreement shall provide for qualifications, terms and conditions or employment for the assessor and employees of his office. The agreement may provide for inclusion of the assessor and said employees in insurance, retirement programs and other benefit programs of one of the constituent parties. Any city or town party to such an agreement may include employees of an assessing district in such programs.

No agreement for joint or cooperative assessing made pursuant to this section shall take effect until it has been approved in writing by the commissioner of revenue.

SECTION 3. Chapter 58 of the General Laws is hereby amended by striking out section 1, as most recently amended by section 1 of chapter 580 of the acts of 1978, and inserting in place thereof the following two sections:-

Section 1. The commissioner of revenue in chapters fifty-eight to sixty-five C, inclusive, called the commissioner, shall make, and from time to time revise, such reasonable rules, regulations and guidelines, as may be necessary to establish minimum standards of assessment performance. The specific areas to which such standards relate shall include but not be limited to the following: the administration of all laws providing for the assessment and classification of property; the methods of determining the actual fair cash valuation of different kinds of property for tax purposes; the types of qualifications of assessing personnel; and the adequacy of tax maps and other records.

Section 1A. The commissioner, in addition to exercising the powers or performing the duties otherwise assigned to him, shall enforce all laws relating to the valuation, classification and assessment of property and shall supervise the administration of such laws by local assessors in accordance with the rules, regulations and guidelines established under the provisions of section one.

He shall determine whether or not the locally assessed values represent

the full and fair cash valuation for each class of real property, as defined in section three (b) of chapter fifty-nine, and personal property not exempt from local taxation within each city and town. In each city and town which he has determined to be assessing at full and fair cash valuation, he shall determine a minimum residential factor for each city and town which shall be sixty-five per cent subject to such adjustment upward as may be required to provide that the percentage of the total tax levy imposed on any class of real or personal property shall not exceed one hundred fifty per cent of the full and fair cash of the taxable property in said class divided by the full and fair cash of all taxable real and personal property in the city or town. In no instance, however, shall the minimum residential factor, so determined, be greater than the amount of one hundred per cent, although a city or town may decide to adopt a residential factor greater than that amount. For this purpose, he may utilize the information on assessed values and classifications gathered pursuant to sections nine and ten and such other information as may be available to him. The taxable values and minimum residential factor so determined shall be sent to the individual cities and towns on or before April first of each year in which there is to be a determination of the percentages of the local tax levy to be borne by each class of property pursuant to section fifty-six of chapter forty.

In the performance of such duties, he may visit any city or town, inspect the work of its assessors and require of them any information he shall deem necessary regarding the procedures used in keeping records, maintaining tax maps and determining the valuation and classification for taxation of the property or any part thereof in such city or town. He shall require of them such action as will tend to produce uniformity within such city or town and throughout the commonwealth in the valuation, classification and assessment of property for local taxation.

He may require from state and town officers such returns and statements relative to the amount and value of taxable property in the several towns as he deems necessary. Information provided by said assessors shall include: (1) the total of all property subject to local taxation in each city and town, (2) the amount, if any, of tax abatements for the preceding year, and (3) such other information as may be required to aid the commissioner in the discharge of his responsibility in respect to the preparation of the equalization and apportionment report as provided in sections nine and ten.

He shall, at the request of the assessors of any city or town or upon his

own initiative, give his opinion to assessors and collectors upon any question arising under any statute relating to the assessment, classification and collection of taxes or he may obtain the opinion of the attorney general upon such question. In either case, the opinion of the commissioner or the opinion of the attorney general, if any, shall be binding.

He shall issue, and may from time to time revise, a list of private firms or individuals qualified to perform appraisals or reappraisals of property for tax purposes in the commonwealth and shall make such list available to assessors. In any case where a city or town proposes to contract with any such private firm or individual for such appraisal or reappraisal services, such contract shall be with a firm or individual determined by the commissioner to be qualified to perform such services and said contract shall be approved as to form and content by the commissioner. Upon completion, he shall certify that valuations established under such appraisal or reappraisal of property for tax purposes by any such firm in the commonwealth comply with guidelines established under section one. Firms or individuals aggrieved by a decision of the commissioner that they are not qualified to perform appraisals or reappraisals of property for tax purposes in the commonwealth may appeal such decision to the appellate tax board.

He may cause an assessor to be prosecuted, either in the county where said officer resides or in an adjoining county, for any violation of law relative to assessment or classification of taxes for which a penalty is imposed. He may appear before any court or before any board of county commissioners sitting for the abatement of taxes, or before the appellate tax board.

SECTION 4. Said chapter 58 is hereby further amended by striking out section 3, as most recently amended by section 2 of said chapter 580, and inserting in place thereof the following section:-

Section 3. In order to assist the assessors in the performance of their duties, the commissioner shall prepare, issue and periodically revise guides for local assessors. Such guides shall include the rules, regulations, and guidelines of the commissioner relative to the assessment, classification and administration of local taxes, an appraisal manual and, in addition, may include special studies, cost and price schedules, news and reference bulletins and digests of laws relating to local taxation. He shall prepare and issue such other printed instructions to the assessors which are adapted to varying local circumstances and to differences in the character and condition of property subject to local taxation as he shall deem necessary.

He shall conduct or sponsor in-service, pre-entry, and intern training programs on the technical, legal, and administrative aspects of the assessment process and may require assessors to attend such programs. Such programs shall include but not be limited to training required to meet minimum standards of assessment and classification performance established in accordance with section one. The commissioner may contract with educational institutions or appropriate professional associations to provide such training programs. He shall develop, prescribe, and require the use of all forms necessary for administration of the laws relating to the taxation of property. So far as practicable, the forms shall be uniform, but nothing herein shall be deemed to prevent the prescribing of substitute or additional forms where special circumstances require.

He shall annually, on or about January first, furnish to each board of assessors all the information relating to the assessment, classification, valuation and ownership of property taxable in their town that has come into possession of his department, particularly under chapter sixty-five and sixty-five C.

He shall cause a representative of his office to visit every city or town to give to the assessors such assistance as may be authorized or required by law.

SECTION 5. Said chapter 58 is hereby further amended by striking out section 4, as amended by section 4 of said chapter 580, and inserting in place thereof the following four sections:-

Section 4. Whenever it appears to the commissioner that the property, or any part thereof, in any town is not valued for taxation according to the first paragraph of section thirty-eight of chapter fifty-nine, and that such failure to comply with the law is the result of failure of the city or town to meet the minimum standards prescribed by the commissioner under the provisions of section one, including but not limited to minimum standards for keeping records of valuation, classification and ownership, production and maintenance of tax maps, and use of the opinions guides, manuals or other information furnished the assessors under the provisions of sections one A and three by the commissioner, or is due to failure on the part of its assessors, or any of them, to properly examine the records of the registry of deeds and probate court, he shall forthwith direct said assessors to meet the minimum standards required, to make use of the opinions, guides, manuals or other information furnished by him, and to make such examinations of the records of the registry

of deeds and probate court as he deems necessary to correct the failure of the town to value any or all of the property for taxation according to law. On failure by the assessors, or any of them, to comply with such directions of the commissioner, for any reason, he shall forthwith notify the mayor or the selectmen, in writing, of said failure and of any requirements which he deems necessary to expedient to insure proper performance, valuation and classification of property for taxation according to law. Such notice shall contain a statement that failure of the town to comply with such requirements will result in court action.

At the request of local assessors, he shall, subject to appropriation, contract on behalf of the city or town for engineering, professional or technical services for the installation of such record keeping system, the production and installation of tax maps, the appraisal or reappraisal of property, or such other action as has required for the town to meet the minimum standards prescribed.

Section 4A. If such city or town fails, within a reasonable time, to comply with the notice and requirements of the commissioner and continues to fail to meet the minimum standards provided in section one and to value property for taxation in violation of section thirty-eight of chapter fifty-nine, (a) the commissioner may, subject to appropriation, contract on behalf of the city or town to provide engineering, professional or technical services for the installation of such record keeping systems, the production and installation of tax maps, the appraisal or reappraisal of property, or such other action as he has required for the town to meet the minimum standards prescribed, or (b) a single justice of the supreme judicial court may, on the petition of the commissioner, order the mayor or selectmen to comply with the requirements of the commissioner or order its assessors to value property for taxation at its fair cash valuation and to classify real property according to use and to meet the minimum standards necessary to accomplish this within a definite period of time to be determined by the court. The commissioner shall file with his petition copies of his directions to the assessors and of his notice to the mayor or selectmen under the provisions of section four, together with such other evidence in his possession which he has collected in accordance with sections one A and six as will be helpful to the court in determining whether or not such an order should be issued.

Section 4B. A city or town whose mayor or selectmen and assessors have been ordered by the court under section four A to comply with the requirements of the commissioner may request said commissioner to provide engineering,

professional or technical services for the installation of such record keeping systems, the production and installation of tax maps, the appraisal or reappraisal of property, the classification of property, or such other action as may be necessary for such city or town to comply with such court order.

Section 4C. Whenever the commissioner provides any service under the provisions of section four, four A or four B, the costs of such services shall be incurred by the commonwealth; and payment therefore shall be deducted by the state treasurer under the provisions of section twenty A of chapter fifty-eight from any amount distributable or payable by the commonwealth to such city or town.

Whenever, in the opinion of the commissioner, it is necessary for an assessor to attend any training program under the provisions of section three, the registration fees, costs of study material and necessary travel expense will be paid by the city, town or district or such assessor.

SECTION 6. Said chapter 58 is hereby further amended by striking out section 6, as amended by section 5 of chapter 580 of the acts of 1978, and inserting in place thereof the following section:-

Section 6. The commissioner may collect and tabulate information as to the classification, sales price and fair cash value of real estate in the several towns. For this purpose he may require assessors to furnish him with any information in their possession, may consult persons likely to have knowledge as to the classification, sales price and fair cash value of separate parcels of real estate, and may examine probate and other relevant records.

SECTION 7. Sections seven A to seven E, inclusive, of said chapter 58 is hereby repealed.

SECTION 8. Said chapter 58 is hereby further amended by striking out section 10, as most recently amended by section 7 of chapter five hundred and eighty of the acts of nineteen hundred and seventy-eight, and inserting in place thereof the following section:-

Section 10. In determining the equalized valuations required by section nine, the commissioner shall make and issue such comprenensive assessment ratio studies of the average level of assessment, the degrees of assessment, uniformity, and over-all compliance with assessment and classification requirements for each major class of property in each city and town of the commonwealth as he shall deem appropriate to indicate the degree of compliance with the law and rules and regulations for the assessment and classification of property in each city and town.

For the purposes of this section, the commissioner shall collect and tabulate information relative to all sales of real estate and shall also cause appraisals to be made of properties of various classes in each city and town sufficient in number and so selected, by random sampling or otherwise, as to (a) confirm the assessment ratio derived from selling prices, (b) assist in determining assessment ratio wherever the number of sales is insufficient to represent all properties of any specific class in a city or town, (c) provide a substitute for selling prices of properties of a unique character or which are sold at infrequent intervals, and (d) establish an assessment ratio for personal property assessed in each city or town.

The commissioner may require from state, city and town officers and from individual property owners such returns and statements relative to the amount and value of taxable property and the income derived therefrom in the several cities and towns as he deems necessary. If a city or town fails to submit such information in its possession or which it can reasonably be expected to obtain as the commissioner requests in writing for use in determining the equalized valuations required by section nine and such failure continues for thirty days after such written request, such city or town shall not have a right to submit testimony to the commissioner as provided under section ten A and the decision of the commissioner with respect to such city or town shall be final.

SECTION 9. Section 17B of said chapter 58, as most recently amended by section 8 of said chapter five hundred and eighty, is hereby further amended by striking out the second sentence and inserting in place thereof the following sentence:- Such losses of taxes as determined by the commissioner shall be based on the then current tax rate in each town in which property has been taken for flood control reservoirs and on the average assessed valuation for a period of five years prior to the acquisition of said land; provided, however, that whenever a town wherein a flood control reservoir or portion thereof is located shall have made a general revaluation of property subject to the annual municipal taxes for such town, the commissioner may use such revaluation for determining the taxes for which payment shall be made.

SECTION 9A. The first sentence of section 6 of chapter 58A of the General Laws is hereby amended by striking out the words "; chapter fifty-nine A", inserted by section 10 of chapter 580 of the acts of 1978.

SECTION 10. Said chapter 58A is hereby further amended by adding the following section:-

Section 14. In cases where the appellate tax board finds that a taxpayer

is being assessed disproportionately with respect to other properties within the same city or town, the board shall compute the measure of damages in the following manner:

(1) by computing an equalized tax rate by dividing the total taxes as assessed for that city or town for the year for which the finding was made by the fair cash value of the city or town, which shall in no event be higher than the equalized value as finally reported to the general court by the state tax commission pursuant to section ten C of chapter fifty-eight for that city or town in the year next preceding the year for which the finding was made.

(2) by applying the rate as computed in accordance with subsection one to the fair cash value of the property and thereby determine the taxes which should have been paid.

(3) by subtracting the amount of taxes which should have been paid from those actually paid or assessed.

In such cases within a city or town that has been certified for classification by the commissioner under the provision of section fifty-six of chapter forty and has implemented such classification system the measure of damages shall be computed on the basis of the tax rate of the class in which the property has been assessed.

SECTION 11. Chapter 59 of the General Laws is hereby amended by inserting after section 2, the following two sections:-

Section 2A. (a) Real property for the purpose of taxation shall include all land within the commonwealth and all buildings and other things thereon or affixed thereto, unless otherwise exempted from taxation under other provisions of law. The assessors of each city and town shall determine the fair cash valuation of such real property for the purpose of taxation on the first day of January of each year.

Mortgages upon buildings or other things, which with the land upon which they are erected or to which they are affixed are taxable as real estate defined herein, shall be deemed mortgages of real estate for the purpose of taxation, and shall be taxed under sections eleven to fourteen, inclusive.

(b) The assessors shall determine the fair cash valuation of such real property according to section thirty-eight; and if the city or town has been certified by the commissioner pursuant to clause (c) of this section shall classify such real property according to the following uses:-

"Class one, residential", property used or held for human habitation containing one or more dwelling units including rooming houses with facilities

designed and used for living, sleeping, cooking and eating on a non-transient basis. Such property includes accessory land, buildings or improvements incidental to such habitation and used exclusively by the residents of the property or their guests. Such property shall not include a hotel, or motel. Such property may be exempt from taxation under other provisions of law.

"Class two, open-space", land which is not otherwise classified and which is not taxable under the provisions of chapter sixty-one or sixty-one A, or taxable under a permanent conservation restriction or lands otherwise taxed for recreational purposes under other provisions of law, and which land is not held for the production of income but is maintained in an open or natural condition and which contributes significantly to the benefit and enjoyment of the public.

"Class three, commercial", property used or held for use for business purposes and not specifically includible in another class, including but not limited to any commercial, business, retail, trade, service, recreational, agricultural, artistic, sporting, fraternal, governmental, educational, medical or religious enterprise, for non-profit purposes. Such property may be expressly exempt from taxation under other provisions of this chapter.

"Class four, industrial", property used or held for use for manufacturing, milling, converting, producing, processing or fabricating materials; the extraction or processing of materials unserviceable in their natural state to create commercial products or materials; the mechanical, chemical or electronic transformation of property into new products and any use that is incidental to or an integral part of such use, whether for profit or non-profit purposes; and property used or held for uses for the storage, transmitting and generating of utilities regulated by the department of public utilities. Such property may be exempt from taxation under other provisions of law.

Where real property is used or held for use for more than one purpose and such uses result in different classifications, the assessors shall allocate to each classification the percentage of the fair cash valuation of the property devoted to each use according to the guidelines promulgated by the commissioner.

Real property which is exempt from taxation under section five shall be classified according to said guidelines.

(c) Classification of real property shall not be implemented in any city or town until the commissioner has certified in writing to the assessors of such city or town assessing property at full and fair cash valuation as required by section thirty-eight and that a majority of its assessors are

qualified to classify its property.

Section 2B. Except as otherwise provided in section three E, real estate owned in fee or otherwise or held in trust for the benefit of the United States, the commonwealth, or a county, city or town, or any instrumentality thereof, if used in connection with a business conducted for profit or leased or occupied for other than public purposes, shall for the privilege of such use, lease or occupancy, be valued, classified, assessed and taxed annually as of January first to the user, lessee or occupant in the same manner and to the same extent as if such user, lessee or occupant were the owner thereof in fee, whether or not there is any agreement by such user, lessee or occupant to pay taxes assessed under this section; provided, however, that whenever under the constitution of laws of the United States the privilege of such use, lease or occupancy of real estate owned by the United States cannot be taxed as aforesaid, but a leasehold or other interest in such real estate or the ownership of or an interest in buildings and other things erected thereon or affixed thereto, may be taxed, such interest or ownership shall be valued, classified, assessed and taxed to the holder thereof to the extent permitted by such constitution and laws. Except as otherwise provided, a payment purporting to be in lieu of a local tax for a particular year on real estate subject to this section shall be applied in reduction of the tax assessed under this section for such year with respect to such real estate. Notwithstanding any contrary provision of section fifteen, unless there is a different agreement, no tax assessed under this section shall be retained out of rent or recovered under section fifteen.

No tax assessed under this section shall be a lien upon the real estate with respect to which it is assessed; nor shall any such tax be enforced by any sale or taking of such real estate; but the interest of any lessee therein may be sold or taken by the collector of the town in which the real estate lies for the nonpayment of such tax in the manner provided by law for the sale or taking of real estate for nonpayment of annual taxes. Such collector shall have for the collection of taxes assessed under this section all other remedies provided by chapter sixty for the collection of annual taxes upon real estate.

This section shall not apply to a use, lease or occupancy which is reasonably necessary to the public purpose of a public airport, port facility, Massachusetts Turnpike, transit authority or park, which is available to the use of the general public or to easements, grants, licenses or rights of way of public utility companies; to the property of the United States, or any

instrumentality thereof, for which payments are made in lieu of taxes in amounts equivalent to taxes which might otherwise be lawfully assessed, in behalf of the United States or any instrumentality thereof; or to the property of the United States, or any instrumentality thereof, which is used by a manufacturing corporation so classified under chapter fifty-eight.

SECTION 12. Said chapter 59 is hereby further amended by inserting after section 5B, the following four sections:

Section 5C. With respect to each parcel of real property classified as Class one, residential, in each city or town certified by the commissioner to be assessing all property at its full and fair cash valuation, and at the option of the board of selectmen or mayor, with the approval of the city council, as the case may be, there shall be an exemption equal to not more than ten per cent of the average assessed value of all Class one, residential, parcels within such city or town. This exemption shall be in addition to any exemptions allowable under section five; provided, however, that in no instance shall the taxable valuation of such property after all applicable exemptions be reduced below ten per cent of its full and fair cash valuation, except through the applicablility of clause eighteen of section five. Where, under the provisions of section five, the exemption is based upon an amount of tax rather than on valuation, the reduction of taxable valuation for purposes of the preceding sentence shall be computed by dividing the said amount of tax by the residential class tax rate of the city or town and multiplying the result by one thousand dollars. For purposes of this paragraph, "parcel" shall mean a unit of real property as defined by the assessors in accordance with the deed for such property and shall include a condominium unit.

Section 5D. Property held by a city, town or district including the metropolitan water district, in another city or town for the purpose of a water supply, the protection of its sources or a sewage disposal, or of a public airport if yielding no rent, shall not be liable to taxation therein; but the city, town or district so holding it shall annually on July first, pay to the city or town in which such property is located an amount equal to that which such city or town would receive in taxes upon the average of the assessed taxable valuation of the land, which shall not include buildings or other structures except in the case of land taken for the purpose of protecting the sources of an existing water supply, for the three years last preceding the acquisition thereof, the valuation for each year being reduced by all abatements thereon. Whenever a city or town in which such land is located

S 1916

shall have made a general revaluation of all its real property for purposes of taxation, the valuation of such land for the purpose of payments authorized by this section shall be determined by the commissioner of revenue as of January first, between January first and June first, in the year succeeding such revaluation and in every fifth year thereafter, so that the payment with respect to such land shall remain substantially the same as that made prior to such revaluation. The city, town or district owning such land, if aggrieved by the determination of the commissioner, may within six months after written notice thereof appeal to the appellate tax board. Any part of such land or buildings from which any revenue in the nature of rent is received shall be subject to taxation. Revenue received for the use of such areas of land within the property so held for the purpose of a public airport as are used for the take-off and landing of aircraft, including runways and taxi strips, or for the use of buildings on such property which are used as a terminal or administration building or for housing, servicing and repairing aircraft, shall not be deemed to be rent or revenue in the nature of rent within the meaning of this paragraph.

If such land is part of a larger tract which has been assessed as a whole, its assessed valuation in any year shall be taken to be that proportional part of the valuation of the whole tract which the value of the land so acquired, exclusive of buildings, bore in such year to the value of the whole tract.

Section 5E. The assessors of a city or town where land is acquired by such other city, town or district for water supply or sewage disposal or for a public airport shall, within one year after such acquisition, determine the average valuation of such land under section five D and certify the amount so determined to such other city, town or district. The mayor or selectmen, the commissioners or prudential committee of a district, or the metropolitan district commission, within six months after receipt of said certificate, may appeal from such determination to the appellate tax board; and upon the appeal said board shall determine the valuation in the manner provided in the preceding section, and section sixty-five, so far as applicable, shall govern such appeal.

If land within any city or town shall have been taken from it for said purposes, and for any one of the three years prior to the taking shall have been used for any public purpose, and for that reason no taxes have been collected thereon, the city or town and the board or officer having charge of the land so taken may within six years after such taking agree as to the value

of the land upon which the annual payment is to be made as aforesaid from the time of the taking, and if they cannot agree the board or officer shall notify the city or town thereof, and thereupon the value shall be determined by the appellate tax board under said section sixty-five, and said notice shall be deemed to be the notice referred to in said section sixty-five. This section and section five D shall apply to property held for the purposes of the metropolitan water supply, except property situated in Ashland, Boylston, Holden, Hopkinton, Sterling or West Boylston, but shall apply only to property acquired by a city, town or district, including the metropolitan water district, prior to January first, nineteen hundred and forty-six.

Section 5F. Land acquired on or after January first, nineteen hundred and forty-six, by a municipality or a district, including the metropolitan water district, and held on January first in any year for any public purpose by such municipality, in this section referred to as the holding municipality, or by such district, if such land is located in a municipality other than such holding municipality, or, in the case of land so acquired and held by a district, in a municipality other than the municipality or municipalities in which the district lies or which constitute the district, shall, with all buildings and other things erected thereon or affixed thereto, be exempt from taxation for the next following fiscal year except as hereinafter otherwise provided: such holding municipality or district shall, on July first of such year, pay to the municipality in which such land is located the amount which would be assessable for the next following fiscal year upon a valuation equal to the average of the assessed taxable valuations of the land and all buildings and other things erected thereon or affixed thereto on the three assessment dates next preceding the acquisition of the land, the assessed valuation for each assessment date being reduced by all abatements, if any. If land subject to this section was not separately assessed or was exempt from taxation on any of said assessment dates, the fair cash value of the land and all buildings and other things erected thereon or affixed thereto on such assessment date shall for the purposes of this section be deemed to be the assessed valuation thereof on such date. Whenever a city or town in which such land is located shall have made a general revaluation of all its real property for purposes of taxation, the valuation of such land for the purpose of payments authorized by this section shall be determined by the commissioner of revenue as of January first, between January first, and June first, in the year succeeding such general revaluation and in every fifth year thereafter. The holding municipality or

district, if aggrieved by the determination of the commissioner, may within six months after written notice thereof appeal to the appellate tax board.

The assessors of the municipality where land subject to this section lies shall determine the average valuation in accordance with this section and certify such valuation to the holding municipality or district liable under this section. Such holding municipality or district, if aggrieved by such determination, may within three months, after such certification appeal to the appellate tax board, which shall determine the average valuation in accordance with this section.

If rent or any revenue in the nature of rent is received from any part of any real estate subject to this section, the party yielding such rent or revenue shall be subject to taxation. The tax shall be in addition to the amount payable under this section. Revenue received for the use of such portions of a public airport as are used for the taking-off and landing of airplanes, including runways, taxi and transition strips, or revenue received for the use of buildings on a public airport, which are actually and exclusively used for servicing and repairing airplanes, shall not be deemed to be rent or revenue in the nature of rent within the meaning of this paragraph.

SECTION 13. Said chapter 59 is hereby further amended by inserting after section 12, the following six sections:

Section 12A. If the holder of such mortgage fails to file in the assessor's office a sworn statement of all his estate liable to taxation under the preceding section, including a statement of the full amount remaining unpaid upon such mortgage and of his interest therein, the amount stated in the mortgage shall be inclusive as to the extent of such interest; but his interest in such real estate shall not be assessed at a greater sum than the fair cash valuation of the land and the structures thereon or affixed thereto; and the amount of a mortgage interest in an estate divided after the creation of such mortgage need not be apportioned upon the several parts of such estate, except as provided in sections seventy-nine to eighty-one, inclusive. Whenever, in any case of mortgaged real estate, such statement is not brought in, no tax on such real estate for the year then current shall be invalidated for the reason that a mortgagee's interest has not been assessed to him.

Section 12B. Mortgagors and mortgagees referred to in the two preceding sections shall for the purpose of taxation be deemed joint owners until the mortgagee takes possession; and until such possession is taken by a first mortgagee, an assessor or the collector of taxes, upon application, shall give

to any such mortgagee or mortgagor a tax bill showing the whole tax on the mortgaged estate and the amount included in the valuation thereof as the interest of each mortgagee and of the mortgagor respectively. If the first mortgagee is in possession, he shall be deemed sole owner; and any other mortgagee in possession shall be deemed joint owner with prior mortgagees.

Section 12C. If a tenant paying rent for real estate is taxed therefor he may retain out of his rent the taxes paid by him, or may recover the same in an action against his landlord, unless there is a different agreement between them.

Section 12D. The undivided real estate of a deceased person may be assessed to his heirs or devisees, without designating any of them by name, until the names of such heirs or devisees appear in the probate court records in the county in which said real estate lies; and each heir or devisee shall be liable for the whole of such tax, and when paid by him he may recover of the other heirs or devisees their respective proportions thereof.

Section 12E. The real estate of a person deceased, the right or title to which is doubtful or unascertained by reason of litigation concerning the will of the deceased or the validity thereof, may be assessed in general terms to his estate, and said tax shall constitute a lien upon the land so assessed and may be enforced by sale of the same or a part thereof, as provided for enforcing other liens for taxes on real estate.

Section 12F. Wherever real estate has been unassessed because the right or title thereto has been doubtful or unascertained because of missing records or otherwise, and a municipality has conducted a search and has determined the record ownership of said real estate, the said real estate shall become subject to a lien for the expenditures incurred by said municipality in the determination of said ownership. The assessor of said municipality shall forthwith cause to be recorded in the registry of deeds for the county or district in which the real estate is located a statement containing the name of the owner or owners of said real estate, an adequate description thereof, and the amount of said expenditures incurred, for which amount a lien on said real estate shall become effective as of the time and date of its recording. No such lien shall be effective against a bona fide purchaser or other transferee without notice of such lien. The recording fee for such statement shall be added to and become a part of the expenditures constituting said lien.

SECTION 14. Said chapter 59 is hereby further amended by striking out section 23A, as most recently amended by section 21 of chapter 766 of the acts

S 1916

of 1971, and inserting in place thereof the following section:-

Section 23A. The assessors, as soon as the tax rates are fixed for a fiscal year, shall notify the auditor or similar officer in cities and towns, the town accountant, if any, otherwise the town treasurer, of the amount to be raised for state, county, and city or town purposes, and for overlay, specifying the amounts, as determined by percentages provided to them by section fifty-six of chapter forty, if applicable, to be levied on each class of real and personal property, and to accrue from estimated receipts.

SECTION 15. Said chapter 59 is hereby further amended by striking out section 38, as most recently amended by chapter five hundred and seventy-six of the acts of nineteen hundred and seventy-eight, and inserting in place thereof the following section:-

Section 38. The assessors of each city and town shall at the time appointed therefor make a fair cash valuation of all the estate, real and personal, subject to taxation therein, and such determination shall be the assessed valuation of such estate. In cities, the assessors may, in any year, divide the city into convenient assessment districts.

The assessed valuation of real property subject to taxation under this chapter shall be classified as follows:

Class one, residential;

Class two, open;

Class three, commercial, and

Class four, industrial.

The resulting amount shall be the taxable valuation of each class of property to which the assessors shall apply the tax rates applicable to each class as determined under section twenty-three A of chapter fifty-nine of the city or town, to determine the tax due and payable on such property.

SECTION 16. Said chapter 59 is hereby further amended by inserting after section 38C, the following two sections:-

Section 38D. A board of assessors may request the owner or lessee of any real property to make a written return under oath within sixty days containing such information as may reasonably be required by it to determine the actual fair cash valuation of such property.

Failure of an owner or lessee of real property to comply with such request within sixty days after it has been made shall bar him from any statutory appeal under this chapter, unless such owner or lessee was unable to comply with such request for reasons beyond his control. If any owner or lessee of real property in a return made under this section makes any statement which he

knows to be false in a material particular, such false statement shall bar him from any statutory appeal under this chapter.

Section 38E. A board of assessors may require testimony under oath of a taxpayer relative to his written return filed under section thirty-eight D and may also require testimony under oath of any applicant for abatement under section fifty-nine.

SECTION 17. Said chapter 59 is hereby amended by striking out section 44, as most recently amended by section 31 of chapter 580 of the acts of 1978, and inserting in place thereof the following section:-

Section 44. The list shall exhibit the valuation, classification and assessment of the estates of the inhabitants assessed; and the valuation, classification and assessment of the estates of nonresident owners, and shall contain the names of the nonresident owners of the property assessed, or such description of them as can be given, their places of abode, if known, the description of their estate, and the tax thereon.

SECTION 18. Said chapter 59 is hereby further amended by inserting after 78, the following section:-

Section 78A. If real property is divided by sale, mortgage, upon a petition for partition or otherwise after a tax has been assessed thereon and such division has been duly recorded in the registry of deeds, the assessors, at any time before said real property has been advertised for sale for nonpayment of taxes, upon the written request of the owner or mortgagee of any portion thereof, shall apportion said tax, with costs and interest upon the several parcels thereof, in proportion to the value of each, and only the portion of said tax, interest and costs so apportioned upon any such parcel shall continue to be a lien upon it; and the owners or mortgagees shall be liable only for the tax apportioned upon the parcel owned in whole or in part by them respectively. If a tax so apportioned upon any parcel remains unpaid after such a commitment to the collector, it may be recovered in an action of contract or in any other appropriate action, suit or proceeding brought by the collector either in his own name or in the name of the town against said owners and mortgagees. Assessors shall send notice of the request for such apportionment and of the time appointed thereof, by mail, to every person interested in said real property whose address is known to them.

SECTION 19. Section 3A of chapter 60 of the General Laws, as most recently amended by section 39 of chapter 580 of the acts of 1978, is hereby further amended by striking out the third, fourth and fifth sentences and

inserting in place thereof the following two sentences:- Every bill or notice for real or personal property tax shall have printed thereon in a conspicuous place the school tax rate, the general tax rate and the total tax rate for each class within the town, as determined by the assessors. In addition, every bill or notice for a tax upon real property shall, by street and number, or, if no street number has been assigned, by lot number or by name of property or otherwise, describe in a manner sufficient to identify it, each parcel of real property separately assessed and shall state for each such parcel the assessed fair cash valuation of the land, the aggregate assessed valuation of the buildings and other things erected thereon or affixed thereto, the total assessed fair cash valuation, the classification of the property, total taxable valuation of the property, the residential exemption, if applicable, and the tax due and payable on such property; provided, however, that if there are three or more buildings or structures on any such parcel, a bill or notice for a tax on such parcel shall also state, or be accompanied by a paper stating, the assessed valuation of each building or structure on such parcel.

SECTION 20. Section 2 of chapter 61 of the General Laws, as most recently amended by section 89 of chapter 514 of the acts of 1978, is hereby further amended by striking out the fourth paragraph and inserting in place thereof the following paragraph:-

The owner shall pay annually a land tax on the bare land, based upon a valuation of not more than ten dollars per acre, at the rate determined to be applicable to class three, commercial property under chapter fifty-nine.

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SECTION 21. Section 4 of chapter 61A of the General Laws is hereby amended by adding the following paragraph:-

The rate of tax applicable to such agricultural or horticultural or recreational land shall be the rate determined to be applicable to class three, commercial property under chapter fifty-nine.

SECTION 22. Notwithstanding any provisions of section one of chapter fifty-eight of the General Laws, as inserted amended by section 3 of this act, any person who on the effective date of this act shall have been elected or appointed an assessor in any city or town and who is continuing to perform such duties on the date the commission establishes the minimum standards for qualifications of assessing personnel required by said section one shall have three years from such date to acquire the necessary qualifications.

SECTION 23. Sections thirty-eight, forty-one and forty-two of chapter five hundred and eighty of the acts of nineteen hundred and seventy-eight are hereby repealed.

SECTION 24. The provisions of section ten of this act shall apply to all cases before the Appellate Tax Board upon the effective date of this act and all other cases filed thereafter relative to assessments for the fiscal years ending on or before June thirtieth, nineteen hundred and eighty-three.

SECTION 25. Section ten of this act shall take effect on the effective date of this act and the remaining sections of this act shall take effect on January first, nineteen hundred and eighty and apply to the assessment and classification of all property for the fiscal years commencing on or after July first, nineteen hundred and eighty.

Approved November 16, 1979.

Appendix V-C

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

	Towns Approved @ Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P.T.B.	Tot Val
1.	Abington*	90.1885	1	35.60	168,4
2.	Acushnet*	92.3051	92.3051	R=23.79 CIP=38.67	103,9
3.	Alford	91.3867	1	13.50	16,0
4.	Amherst	89.4066	1	29.60	261,8
5.	Ashfield	91.4161	1	19.30	33,6
6.	Belmont	95.5228	1	26.60	717,4
7.	Berkley	96.0375	1	23.00	37,8
8.	Bolton*	87.5039	1	21.80	69,4
9.	Bourne*	86.4837	1	21.60	344,5
0.	Buckland	90.4443	1	24.50	33,0
1.	Cheshire*	90.4724	1	17.50	46,0
2.	Chesterfield	78.9032	1	23.00	20,2
3.	Cummington	87.9740	1	25.50	13,1
4.	Danvers	76.7668	1	27.50	558,9
5.	Dighton	81.3527	81.9777	R=21.40 O=18.20 CIP=39.10	103,5
6.	Dudley*	89.2483	1	15.75	113,3
7.	E. Bridgewater	86.0691	1	33.00	160,12
8.	Easthampton*	86.6920	1	30.50	177,90
9.	Edgartown	90.2236	1	9.00	272,78
0.	Egremont	87.9468			53,30
1.	Essex	91.7330	1	20.80	72,52

FY '79 & '80 Revals that factored to meet certification standards.

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

Towns Approved @ Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P.T.B.	Total Valuatio
Falmouth*	85.5331	1	18.30	898,399,60
Fitchburg*	76.5889	80.5688	RO=41.68 CIP=73.20	362,780,16
Foxborough	87.2588	1	30.50	252,066,10
Franklin				
Freetown	83.1505	83.1505	R=23.52 CIP=42.44	151,368,10
Gay Head	97.9923	1	12.80	29,159,70
Georgetown*	93.4610	1	25.40	96,885,35
Grafton	92.7882	1	25.00	167,981,36
Granville*	90.2483	1	23.00	25,709,85
Gr. Barrington	71.9494	1	27.00	153,848,79
Greenfield*	77.4801	1	44.60	223,398,29
Groveland	93.8791	1	29.50	77,642,31
Hadley	65.0000	1	14.50	113,233,99
Halifax	90.5021	1	31.50	76,447,84
Hancock	80.3450			18,825,08
Hanover*	78.7417	1	32.70	223,850,30
Harvard*	96.5588	1	25.00	110,533,20
Hatfield	80.8001	1	24.00	49,748,79
Ipswich	89.4270	1	24.00	236,464,24
Kingston	82.1287	1	30.50	129,371,62
Lenox	79.6080	1	31.00	117,892,31
Lincoln*	97.1385	1	18.40	213,742,18
Marion	88.4622	1	16.60	157,072,66

& '80 Revals that factored to meet certification standards

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

	Towns Approved @ Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P. T. B.	Tot Val
44.	Mattapoisett	93.5360	1	24.00	131,1
45.	Maynard				
46.	Medfield	95.4946	1	28.30	235,1
47.	Medford	88.5754	88.5754	RO=34.23 CIP=57.97	871,6
48.	Merrimac*	94.3467	1	30.50	56,9
49.	Milford	87.6027	87.6027	RO=32.00 CIP=54.82	313,8
50.	Monson*	87.4165	1	30.60	85,1
51.	Nahant	96.8498	1	24.00	102,7
52.	Nantucket	90.1090	92.6991	R= 8.60 O= 6.87 CIP=12.94	668,9
53.	Newbury*	95.2289	1	23.00	97,3
54.	New Braintree	78.4996	1	25.00	12,6
55.	Norfolk	94.2380	1	25.30	113,2
56.	Norton*	90.3094	1	41.00	153,1
57.	Northampton*	79.7732	1	33.00	371,7
58.	Northborough	83.4862	1	27.00	235,3
59.	North Adams	78.4867	88.3867	RO=24.34 CIP=34.97	175,9
60.	N. Brookfield*	83.1054	1	27.00	49,33
61.	Paxton*	95.3217	1	22.50	71,36
62.	Pelham*	95.1425	1	28.00	21,03
63.	Pembroke	90.2452			226,05
64.	Peru	67.4635	1	27.28	11,69
65.	Petersham	94.7361			26,12

*FY '79 & '80 Revals that factored to meet certification standards.

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

Towns Approved @ Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P.T.B.	Total Valuation
Plymouth	65.0000	1	21.00	988,626,75
Rochester	89.9613	1	21.00	71,398,08
Rockport*	93.7121	1	19.10	223,244,96
Russell*	65.0000	1	23.50	28,209,10
Rutland*	90.8747	1	25.40	54,571,24
Savoy	96.9485	1	18.10	9,875,89
Sharon				
Shrewsbury	89.1443	100.5549	R=21.84 O=18.58 CIP=21.86	439,240,17
Shutesbury				
Somerset*	65.0000	79.9173	R=21.00 O=19.00 CIP=27.00	587,720,26
Southborough*	81.7104	1	26.50	172,522,40
Sterling	79.3400	1	25.00	113,165,55
Sturbridge*	77.3948	1	25.00	120,636,41
Sudbury	90.5946	52.6644	RO=26.40 CIP=39.60	439,318,88
Swansea	86.3056	1	21.00	293,258,63
Taunton*	85.9779	85.9779	RO=30.50 CIP=53.20	433,135,43
Tolland	75.9814			28,469,56
Tyringham*	82.8704	1	12.00	14,857,73

& '80 Revals that factored to meet certification standards.

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

	Towns Approved & Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P.T.B.	To Va
4.	Uxton*	95.3935	1	30.70	60
5.	Watertown	82.6311	82.6590	R=36.95 O=33.30 CIP=60.45	600
6.	Wellesley*	90.1212	1	26.20	826
7.	Wenham*	97.0971	1	24.20	83
8.	West Stockbridge*	88.6565	1	19.80	28
9.	West Newbury*	97.0613	1	29.00	59
0.	Westport	93.7721	1	22.06	260
1.	Westwood	81.3404	92.9763	RO=27.50 CIP=35.00	409
2.	Whately	77.6704			28
3.	Whitman*	87.0122	1	41.90	159
4.	Windsor*	80.2753	1	10.00	17
5.	Winthrop*	96.0197	1	35.40	217
6.	Worthington*	94.0034	1	18.80	21
otal Municipalities (97)		(93)	(87)	(87)	

*FY '79 & '80 Revals that factored to meet certification standards.

FY 1981 - CERTIFICATION/CLASSIFICATION STATUS REPORT AS OF 3/13/81

Towns Approved @ Full Value	MRF %	Residential Factor Selected	Tax Rates Approved P.T.B.	Total Valuation
Water Districts				
Bourne	86.4837	1	1.00	344,542,900
Buzzards Bay (Bourne)	81.3259	1		60,501,620
No. Sagamore (Bourne)	91.5199	1	1.10	35,705,330
So. Sagamore (Bourne)	76.7824	1	.90	14,491,160
Dighton	75.4826	76.01565	R=1.80 O=1.52 CIP=3.54	63,492,282
Buzzards Bay(Plymouth)	92.0401	1		8,952,740
Swansea	86.4293	1		287,000,000
Other Districts:				
No. Dighton Fire	85.9992	86.0936	R= .54 O= .42 CIP= .92	21,194,400
Dighton Electric Light	80.4936	81.0423	R= .32 O= .28 CIP= .60	57,753,817

*FY '79 & '80 Revals that factored to meet certification standards.

OPEN SPACE DISCOUNTS TAKEN - FY 1981 AS OF 3/13/81

Dighton	15%
Dighton Water	15%
Dighton Electric Light	15%
No. Dighton Fire	15%
Freetown	15%
Nantucket	15%
Shrewsbury	15%

RESIDENTIAL EXEMPTIONS - FY 1981 AS OF 3/13/81

Nantucket	$10000
Somerset	4300
Watertown	5800

2683 037